SINUMERIK 810
SINUMERIK 820
Basic Version 3
Software Version 2
Installation Lists

Installation Guide

01.93 Edition

Service Documentation

SINUMERIK 810
SINUMERIK 820
Software Version 3
Installation Lists

Installation Guide

Service Documentation

Valid for:

Control		*Software version*
SINUMERIK 810T	Basic version 3	3
SINUMERIK 810M	Basic version 3	3
SINUMERIK 820	Basic version 3	3
SINUMERIK 820M	Basic version 3	3

January 1993 Edition

SINUMERIK® documentation

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The status of each edition is shown by the code in the ”Remarks” column.

Status code in ”Remarks” *column*:

A . . . New documentation **B** . . . Unrevised reprint with new Order No.
C . . . Revised edition with new status. If factual changes have been made on the page since the last edition, this is indicated by a new edition coding in the header on that page.

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Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

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1 Overview of Modules

1.1 Overview of modules: NC

1.1.1 SINUMERIK 810 Basic version 3

Module	Order No.
810 bus, 24 V	6FX1 133 - 0BA00
24 V DC power supply unit	6EV3 055 - 0BC..
CPU with ACO-processor	6FX1 138 - 5BB03
Interface module	6FX1 121 - 2BC02/ 6FX1 121-2BA03
Video interface module	6FX1 151 - 1BA.. (colour) /-1BB... (monochr.) (replaces 6FX1 126 - 1AA..)
Memory module 3 x 256k	6FX1 128 - 1BA..
Memory module 3 x 256k + 32k RAM	6FX1 128 - 1BB..
EPROM submodule 128k (without EPROMs)	6FX1 128 - 4BB..
EPROM submodule 128k (with 27512 EPROMs)	6FX1 128 - 4BD..
EPROM submodule 256k (without EPROMs)	6FX 1128 - 4BA..
EPROM submodule 256k (with 27512 EPROMs)	6FX1 128 - 4BC..
128k RAM submodule (for configuring)	6FX1 126 - 6BA..
256k RAM submodule (for configuring)	6FX1 135 - 3BA00
Measuring-circuit mod. for analog setpoints (20 mm wide)	6FX1 121 - 4BA..
Measuring-circuit mod. for analog setpoints (40 mm wide)	6FX1 121 - 4BB..
HMS meas. circ. module for 3 actual values (20 mm wide)	6FX1 145 - 6BB00
HMS measuring circuit module for 3 act. val. and analog setpoint (40 mm wide)	6FX1 145 - 6BA00
Setpoint output submodule for HMS measuring circuit module	6FX1 132 - 5BA00
SIPOS absolute encoder submod. for HMS meas. circuit mod.	G33961-A3729-L1
Monitor adapter (brightness and contrast)	6FX1 120 - 0BB..
I/O submodule (with 2 input connectors)	6FX1 124 - 6AA01
I/O submod. (with 3 input connectors) without mounting plate	6FX1 124 - 6AA02
I/O submodule (with 3 input connectors) with mounting plate	6FC3 984 - 3RA
I/O submod. (with 3 input connectors) without mounting plate	6FX1 124 - 6AB02
I/O submodule (with 3 input connectors) with mounting plate	6FC3 984 - 3RD
MPG submodule (for 3 handwheels)	6FX1 126 - 5AA..

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1.1.2 SINUMERIK 820 Basic version 3

Module	Order No.
820 bus, 24V	6FX1 137 - 4BA00
230 V AC power supply unit	6EW1 861 - 3A..
CPU with ACO-processor	6FX1 138 - 5BB..
Interface module	6FX1 121 - 2BC02
Video interface module	6FX1 151 - 1BA.. (replaces 6FX1 126 - 1AA.. + - 4AA)
Memory module 3 x 256k	6FX1 128 - 1BA..
Memory module 3 x 256k + 32k RAM	6FX1 128 - 1BB..
EPROM submodule 128k (without EPROMs)	6FX1 128 - 4BB..
EPROM submodule 128k (with 27512 EPROMs)	6FX1 128 - 4BD..
EPROM submodule 256k (without EPROMs)	6FX1 128 - 4BA..
EPROM submodule 256k (with 27512 EPROMs)	6FX1 128 - 4BC..
128k RAM submodule (for configuring)	6FX1 126 - 6BA..
256k RAM submodule (for configuring)	6FX1 135 - 3BA00
Measuring circuit module for analog setpoints (20 mm wide)	6FX1 121 - 4BA..
Measuring circuit module for analog setpoints (40 mm wide)	6FX1 121 - 4BB..
HMS meas. circuit mod. for 3 actual values (20 mm wide)	6FX1 145 - 6BB00
HMS measuring circuit module for 3 actual values and analog setpoints (40 mm wide)	6FX1 145 - 6BA00
Setpoint output submod. for HMS measuring circuit module	6FX1 132 - 5BA00
SIPOS absolute encoder submodule for HMS measuring circuit module	G33961-A3729-L1
Monitor adapter (brightness and contrast)	6FX1 120 - 0BB..
I/O submodule (with 2 input connectors)	6FX1 124 - 6AA01
I/O submodule (with 3 input connectors) without mounting plate	6FX1 124 - 6AA02
I/O submodule (with 3 input connectors) with mounting plate	6FC3 984 - 3RA
I/O submodule (with 3 input connectors) without mounting plate	6FX1 124 - 6AB02
I/O submodule (with 3 input connectors) with mounting plate	6FC3 984 - 3RD
MPG submodule (for 3 handwheels)	6FX1 126 - 5AA..
Colour memory module	6FX1 126 - 4AA..

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1.2 Overview of modules: mini-EU

Module			Order No. Module-MRPD	Order No. Add-on - MRPD
CU / MPC interface with power supply			6FX1 132 - 1BA01	
Input module	32 inputs		6ES5 420 - 3BA11	6FC9 320 - 8AA
Input module	32 inputs		6ES5 420 - 4UA11	6FC3 988 - 4DB
Input module	64 inputs		6FX1 125 - 7BA00	6FC3 986 - 4DM
Output module	16 outputs	2 A (40 mm wide)	6ES5 444 - 3AA11	6FC9 320 - 8AC
Output module	16 outputs	2 A (40 mm wide)	6ES5 454 - 4UA11	6FC3 988 - 4DJ
Output module	32 outputs	0.5 A (20 mm wide)	6ES5 445 - 3AA12	6FC9 320 - 8AB
Output module	32 outputs	0.5 A (20 mm wide)	6ES5 441 - 4UA11	6FC3 988 - 4DG
Output module	32 outputs	0.5 A (20 mm wide)	6FX1 122 - 8BA01	6FC3 986 - 4DN
Output module	32 outputs	2 A (40 mm wide)	6FX1 122 - 8BB01	6FC3 986 - 4DP

1.3 Overview of modules: maxi-EU

Module			Order No. Module-MRPD	Order No. Add-on - MRPD
CU / MPC interface with power supply			6FX1 132 - 1BB01	
24V DC power supply unit			6EW1 861 - 3A..	
Input module	32 inputs		6ES5 420 - 4UA11	6FC3 988 - 4DB
Input module	64 inputs		6FX1 125 - 7BA00	6FC3 986 - 4DM
Output module	16 outputs	2A (40 mm wide)	6ES5 454 - 4UA11	6FC3 988 - 4DJ
Output module	32 outputs	0.5A (20 mm wide)	6ES5 441 - 4UA11	6FC3 988 - 4DG
Output module	32 outputs	0.5A (20 mm wide)	6FX1 122 - 8BA01	6FC3 986 - 4DN
Output module	32 outputs	2A (40 mm wide)	6FX1 122 - 8BB01	6FC3 986 - 4DP

1.4 CU submodule interface

Module	Order No.
CU submodule interface: Distributed connection for logic submodules	6FX1 136 - 2BA01

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1.5 Master PLC link

Module	Order No.
Master PLC link: Interface module in the NC	6FX 1135 - 6BA
Interface module in the S5	6FX 1135 - 7BB

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2 NC Machine Data

2.1 General values (Softkey GENERAL DATA)

MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
1	Speed behind pre-limit switch	500	15000	IS	1000 units/min
2					
3	Corner deceleration rate	500	15000	IS	1000 units/min
4					
5	No. of input buffer parameters	250	250	----	
6	Threshold for CRC insert blocks	0	2000	IS	units
7	Circle end position monitoring	5	32000	----	units
8	Max. no. of part programs	50	500	----	
9	Error window for repositioning on the circle contour [1)]	200	32000	IS	units
10	Feed after block search	1000	15000	IS	1000 units/min
11	Password	0	9999	----	BCD
13	No. of tool parameters	10	10	----	
14	Cycle MD from R parameter no.	10000	10000	----	
15	Cycle MD to R parameter no.	10000	10000	----	
16	Cycle SD from R parameter no.	10000	10000	----	
17	Cycle SD to R parameter no.	10000	10000	----	
20	Variable of the ring buffer [2)]	0	64	----	KByte
100	Feedrate override position 2	1	150	---	%
101	- // - position 3	2	150	---	%
102	- // - position 4	4	150	---	%
103	- // - position 5	6	150	---	%
104	- // - position 6	8	150	---	%

1) MD 9 active after NC-Start

2) MD 20 Note max. memory extension!
Min. ring buffer variable is 1 KByte.

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MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
105	Feedrate override position 7	10	150	---	%
106	- // - position 8	20	150	---	%
107	- // - position 9	30	150	---	%
108	- // - position 10	40	150	---	%
109	- // - position 11	50	150	---	%
110	- // - position 12	60	150	---	%
111	- // - position 13	70	150	---	%
112	- // - position 14	75	150	---	%
113	- // - position 15	80	150	---	%
114	- // - position 16	85	150	---	%
115	- // - position 17	90	150	---	%
116	- // - position 18	95	150	---	%
117	- // - position 19	100	150	---	%
118	- // - position 20	105	150	---	%
119	- // - position 21	110	150	---	%
120	- // - position 22	115	150	---	%
121	- // - position 23	120	150	---	%
122	- // - position 24	--	150	---	%
123	- // - position 25	--	150	---	%
124	- // - position 26	--	150	---	%
125	- // - position 27	--	150	---	%
126	- // - position 28	--	150	---	%
127	- // - position 29	--	150	---	%
128	- // - position 30	--	150	---	%
129	- // - position 31	--	150	---	%
130	- // position 32	--	150	---	%

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MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
131	Spindle override position 1	50	130	---	%
132	- // - position 2	55	130	---	%
133	- // - position 3	60	130	---	%
134	- // - position 4	65	130	---	%
135	- // - position 5	70	130	---	%
136	- // - position 6	75	130	---	%
137	- // - position 7	80	130	---	%
138	- // - position 8	85	130	---	%
139	- // - position 9	90	130	---	%
140	- // - position 10	95	130	---	%
141	- // - position 11	100	130	---	%
142	- // - position 12	105	130	---	%
143	- // - position 13	110	130	---	%
144	- // - position 14	115	130	---	%
145	- // - position 15	120	130	---	%
146	- // - position 16	120	130	---	%
147	Rap. trav. override position 1	1	100	---	%
148	- // - position 1	10	100	---	%
149	- // - position 1	50	100	---	%
150	- // - position 4	100	100	---	%
151	- // - position 5	--	100	---	%
152	- // - position 6	--	100	---	%
153	- // - position 7	--	100	---	%
154	- // - position 8	--	100	---	%
155	Increase in sampling time [2]	2	5	---	1/2 ms
156	Servo enable cutoff delay [1]	200	1000	---	ms
157	Control type for standard cycles	**810/820T** 1130/2130 **810/820M** 1230/2230		---	

[1] MD 156 active after Power on

[2] The calculation of the sampling time fixed in NC MD 155 is as follows: 4 ms + (0.5 ms x NC MD 155)

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MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
200	Keyboard assignment a/%	037 097	165165	---	---
201	- // - 7/'x'	160 055	165165	---	---
202	- // - 4/I	073 052	165165	---	---
203	- // - 1/F	070 049	165165	---	---
204	- // - +/-/M	077 135	165165	---	---
205	- // - b/ /	047 098	165165	---	---
206	- // - 8/'C'	T 162 056 M 161 056	165165	---	---
207	- // - 5/	074 053	165165	---	---
208	- // - 2/D	068 050	165165	---	---
209	- // - O/S	083 048	165165	---	---
210	- // - C/N	078 099	165165	---	---
211	- // - 9/'Z'	T 161 057 M 162 057	165165	---	---
212	- // - 6/K	075 054	165165	---	---
213	- // - 3/L	076 051	165165	---	---
214	- // - **.**/T	084 046	165165	---	---
215	- // - d/G	071 100	165165	---	---
216	- // - e/'Q'	163 101	165165	---	---
217	- // - f/u	164 102	165165	---	---
218	- // - 'Y'/P 'Y'/	T 080 089 M 080 000	165165	---	---
219	- // - =/H	072 061	165165	---	---
220	- // - / /@	064 047	165165	---	---
221	- // - */A	165 042	165165	---	---
222	- // - /R	082 045	165165	---	---
223	- // - $+/L_F$	010 043	165165	---	---
225	Threshold val. f. circle centre corr.	0	1000		IS
250	Language selection	0	1	---	---
260	Selection rotary axis operation	-1	99	---	---
261	Deselection rotary axis operation	-1	99	---	---

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Channel-specific data (Softkey CHANNEL DATA)

MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
1080	Reset position for G group 0 in channel 1	1	35	---	---
1081	Reset position for G group 0 in channel 2	1	35	---	---
1100	Reset position for G group 2 in channel 1	with T 18 with M 17	19	---	---
1101	Reset position for G group 2 in channel 2	with T 18 with M 17	19	---	---
1120	Reset position for G group 5 in channel 1	54	57	---	---
1121	Reset position for G group 5 in channel 2	54	57	---	---
1140	Reset position for G group 7 in channel 1	with T 64 with M 60	64	---	---
1141	Reset position for G group 7 in channel 2	with T 64 with M 60	64	---	---
1180	Reset position for G group 11 in channel 1	with T 95 with M 94	97	---	---
1181	Reset position for G group 11 in channel 2	with T 95 with M 94	97	---	---

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2.2 Axis-specific values (max. 5 axes) (Softkey AXIAL DATA 1)

MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
2000 **2001** **2002** **2002** **2003** **2004** **2005** **2006**	Axis assignment axis 1 - // - axis 2 - // - axis 3 - // - - // - axis 4 - // - axis 5 - // - axis 6 - // - axis 7	1100 H 1200 H **810/820T:** 0 H **810/820M:** 1300 H 0 H 0 H 0 H 0 H	2300 H 1) . . . . 2300 H 1) 2300 H 1) 2300 H 1) 2300 H 1)		
204*	Coarse stop tolerance range	40	16000	MS	units
208*	Fine stop tolerance range	10	1600	MS	units
212*	Zero speed monitoring	100	16000	MS	units
216*	Tolerance band zero-mark monitoring	0	0	MS	units
220*	Backlash compensation	0	+/- 255	MS	units
224*	Software limit switch 1 pos. 3)	+99999999	+/-99999999	MS	units
228*	Software limit switch 1 neg. 3)	-99999999	+/-99999999	MS	units
232*	Software limit switch 2 pos. 3)	+99999999	+/-99999999	MS	units
236*	Software limit switch 2 neg. 3)	-99999999	+/-99999999	MS	units
240*	Reference point value	0	+/-99999999	MS	units
244*	Reference point shift	0	+/- 9999	MS	units
248*	Tool reference value 3)	0	+/-99999999	MS	units
252*	KV factor	1666	10000	MS	0.01 s^{-1}
256*	Difference time constants	2	9999	-	0.1 s^{-1}
260*	Multgain	2400	64000		
264*	Drive error threshold	9600	15000	-	VELO
268*	Max. set speed (DAC)	8192	8192	-	VELO
272*	Drift compensation	0	+/- 500	-	VELO
276*	Acceleration	50	2000	IS	10000 units/s^2
280*	Max. speed	10000	49000 2)	IS	1000 units/min
284*	Reference point cutoff speed	300	15000	IS	1000 units/min
288*	Feed jog	2000	49000 2)	IS	1000 units/min
292*	Rapid traverse jog	10000	49000 2)	IS	1000 units/min

1) with SPC measuring circuit modules

2) dependent on NC MD 155 and NC MD 584.*

3) dependent on position control resolution (values valid for 0.5 x 10^{-3} mm)

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MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
296*	Reference point approach speed	10000	49000 3)	IS	1000 units/min
300*	Incremental feedrate	500	49000 3)	IS	1000 units/min
304*	Interpolation parameters	**810/820T:** 1, 3, 2 **810/820M:** 1, 2, 3	3	-	1=I 2=J 3=K
308*					
312*					
316*	Pointer compensation + 1)	0	249	-	MD offset
320*	Pointer compensation - 1)	0	249	-	MD offset
324*	Distance between 2 values	0	16000	MS	units
328*	Compensation value	0	100	MS	units
332*	Contour monitoring tolerance band	1000	16000	MS	units
336*	Threshold contour speed	0	24000	MS	1000 units/min
340*	Tool change position	0	+/-99999999	IS	units
344*	Module value for rotary axis (leadscrew error compensation)	360000	92160000	MS	units
348*	Software EXE 2)	1	128		
352*	2nd Kv factor for thread cutting	0	10000	MS	0.01 s^{-1}
360*	Balancing time constant	0	9999	-	0.1 s
364*	Pulse no. for variable increment weighting	1	65000		1/4 * sensor pulses
368*	Traverse path for variable increment weighting 1)	1	65000	MS	0.5 * unit
372*	Deceleration Zero speed monitoring	200	16000	time	1 ms
376*	Pre-limit switch	20000	99999999	MS	units
380*	2nd Kv factor for G36	0	10000	MS	0.01 s^{-1}
384*	Division of linear scale	0	32000	MS	units
388*	Axis-specific weighting factor	0	99999999		
392*	Absolute offset	0	+/- 99999999	MS	units
1096*	Fictitious second reference point	0	+/- 99999999	MS	units

1) *MD 316* and MD 320** *Both compensation pointers must always be specified for leadscrew error compensation, irrespective of whether direction-dependent or direction-independent leadscrew error compensation has been selected.*

*MD 368** *Input unit is 1/2 units, corresponding to position control resolution!*

2) *The following inputs are permissible: 1, 2, 4, 8, 16, 32, 64, 128*

3) *dependent on NC MD 155*

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2.3 Spindle-specific values (max. 2 spindles) (Softkey SPINDLE DATA)

MD No.	Description	Standard value	Maximum input value	Ref. system	Input unit
400*	Spindle assignment	**810/820T:** 1300H **810/820M:** 0H	2300H [1] 2300H [1]	--- ---	
401*	Drift compensation (spindle)	0	+/- 500	---	VELO
402*	Zero mark shift spindle	0	16383	---	360° /(MD 4590x4)
403*	Max. speed for gear 1 [2]	500	16000	---	rev/min
404*	- // - gear 2 [2]	1000	16000	---	rev/min
405*	- // - gear 3 [2]	2000	16000	---	rev/min
406*	- // - gear 4 [2]	4000	16000	---	rev/min
407*	- // - gear 5 [2]	4000	16000	---	rev/min
408*	- // - gear 6 [2]	4000	16000	---	rev/min
409*	- // - gear 7 [2]	4000	16000	---	rev/min
410*	- // - gear 8 [2]	4000	16000	---	rev/min
411*	Min. speed for gear 1	50	16000	---	rev/min
412*	- // - gear 2	500	16000	---	rev/min
413*	- // - gear 3	1000	16000	---	rev/min
414*	- // - gear 4	2000	16000	---	rev/min
415*	- // - gear 5	2000	16000	---	rev/min
416*	- // - gear 6	2000	16000	---	rev/min
417*	- // - gear 7	2000	16000	---	rev/min
418*	- // - gear 8	2000	16000	---	rev/min

1) When using the SPC measuring circuit module

2) Max. speeds for the various gears must be specified in ascending order.
Max. speed spindle speed for DAC = 10 volts

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MD No.	Description		Standard value	Maximum input value	Reference system	Input unit
419*	Accel. time constant	gear 1	2000	16000	---	4 ms
420*	- // -	gear 2	2000	16000	---	4 ms
421*	- // -	gear 3	2000	16000	---	4 ms
422*	- // -	gear 4	2000	16000	---	4 ms
423*	- // -	gear 5	2000	16000	---	4 ms
424*	- // -	gear 6	2000	16000	---	4 ms
425*	- // -	gear 7	2000	16000	---	4 ms
426*	- // -	gear 8	2000	16000	---	4 ms
427*	Cutoff speed for M 19	gear 1	100	16000	---	rev/min
428*	- // -	gear 2	100	16000	---	rev/min
429*	- // -	gear 3	100	16000	---	rev/min
430*	- // -	gear 4	100	16000	---	rev/min
431*	- // -	gear 5	100	16000	---	rev/min
432*	- // -	gear 6	100	16000	---	rev/min
433*	- // -	gear 7	100	16000	---	rev/min
434*	- // -	gear 8	100	16000	---	rev/min
435*	Gain for M 19	gear 1	200	10000	---	rev/min/360
436*	- // -	gear 2	200	10000	---	rev/min/360
437*	- // -	gear 3	200	10000	---	rev/min/360
438*	- // -	gear 4	200	10000	---	rev/min/360
439*	- // -	gear 5	200	10000	---	rev/min/360
440*	- // -	gear 6	200	10000	---	rev/min/360
441*	- // -	gear 7	200	10000	---	rev/min/360
442*	- // -	gear 8	200	10000	---	rev/min/360

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MD No.	Description	Standard value	Maximum input value	Reference system	Input unit
443*	Positional limit for M 19	11	4096	---	approx. 1/11degrees
444*	Spindle speed tolerance	10	100	---	%
445*	Max. spindle speed tolerance	100	100	---	%
446*	Zero speed tolerance [1)]	10	16000	---	0.01%
447*	Servo enable delay	1000	16000	---	ms
448*	Min set motor speed	50	8192	---	VELO
449*	Set speed	50	9999	---	rev/min
450*	Set reciprocation speed	50	8192	---	VELO
451*	Max. spindle speed	4000	16000	---	rev/min
452*	Spindle position for ext. M 19	0	3599	---	0.1 degrees
453*					
454*					
455*					
456*					
457*					
458*					
459*	Pulse number spindle encoder	1024	16000		pulses/rev
461*	Rotary axis assignment	0	max. no. of axes	---	---

Observe ”Spindle limitation” setting data when programming!

1) 0.01% of max. gear speed

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2.4 General bits (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
5000	Name of radius and chamfer (same code as for axis definition without address extension)							
5001	Name of angle (same code as for axis definition, without address extension)							
5002 1)		Input resolution		Reset pos. G70				Position control resolution inch
5003	No decel-eration at limit switch	Working area limit in JOG	I,J,K param. G90/91 dependent	Polar angle G90/91 dependent	PRESET offset not cleared	Aux. func. output before travel	Simulation with G59	Simulation with G58
5004				Own rapid trav. over-ride switch	NC-Start without ref. point	Handwheel available 3	2	1
5005	Key-operated switch group (configurable) 7	6	5	Key-operated switch active for: Zero offset fine	Zero offset+ cycle SD	TO wear	TO geom.	Reserved
5006	Channel-spec. progr. infl.		Key-operated switch active for: MD / reset	TEACH IN	PP manual input	Dry run feed	DRF	Overstore
5007 1)	TO over diameter	TO wear not active	G 90/91 in the block	Enable simulta-neous simulation	Basic TO dim.active	No output of M 17	G 53 as for @706	Length comp. in non-prog. axis
5008 1)		REPOS in jog mode	Set in jog mode	TO type 0 = type 20	Ext. cust. mach. cont. panel avail.	Internal handwheel selection	Ext. mach. control panel available	Internal mach. cont. panel avail.
5009					Blank optimizations string output		M machine control panel	
5010								
5011 1)	Diameter functions for plane axes: @ read/load over dia.	Act. value disp. in dia.	G 91 program	G 90 prog. + TO wear	TO geom + TO wear	Increm. feed handwheel DRF	ZO, Preset repos disp.	
5012	PLC texts from ext. device					MD write with @ disable		
5013	Circle radius program-ming			Feed not contour-related		Addr. exten. in addition to M & S	Tapping without encoder	G63 without feed reduction
5014	Tool nose radius comp.		Reference prep. cycles					
5015		User mem. submodule			ASCII string or erase colour	Graphics		
5016		3964R with BTR						

1) MD 5002 bit 4, 5, 6 valid after RESET
MD 5007 bit 7 active only for types 20 and 30, parameters P4 and P7 (cutter diameter)
MD 5008 bit 0, 1 and MD 5009 bit 1 active after Power On
MD 5008 bit 4 810/820 M only
MD 5011 bit 1-7 functions for plane axis

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2.5 Configurable options (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
5040								
5041								
5042								
5043								
5044								
5045								

MD No.	Description	Standard value	Maximum input value	Ref. system	Input unit
5061	Type of transformation	0	1	---	---
5062	Axis name of first fictitious axis	1111 1111	1111 1111	---	---
5063	Axis name of second fictitious axis	1111 1111	1111 1111	---	---
5064	Axis name of infeed axis	1111 1111	1111 1111	---	---
5065	Axis name of first real axis	1111 1111	1111 1111	---	---
5066	Axis name of second real axis	1111 1111	1111 1111	---	---

2.6 Spindle-specific bits (max. 2 spindles) (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
520*	Spindle override active with thread cutting	No M 19 abort at reset	M 19 with axis movement		Speed in 0.1 rev/min	Pulse encoder available	Actual value sign change	
521* 1)	Spindle available	Internal spindle reset	Speed transfer after acknowl.	M19 ackn. from PLC or M 03/04	No improved M19 posit.	Maintain C-axis operation beyond reset	Set point sign change	Spindle+ axis = 1 meas. circuit
522*								
523*								
524*								

1) MD 5210 bit 7 active after Power On

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2.7 Channel-specific bits (max. 2 channels) (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
540*	No deselect. of transmit on reset	Feedrate in m/min	1)	1)		Analog spindle speed		Auxiliary functions to PLC
542*								
544*								
546*		Auxiliary functions not grouped but output immediately: H		T	S	M		No aux. fcts. at block search
548*		Name of abscissa (horizontal axis) (1st axis of cube) (same code as for axis definition)						
550*		Name of ordinate (vertical axis) (2nd axis of cube) (same code as for axis definition)						
552*		Name of applicate (vertical axis) (3rd axis of cube) (same code as for axis definition)						
554*		Number of axis with constant cutting speed (G96 S) (same code as for axis definition)						
556*								
558*							No CRC alarm at D no. change	Suppl. axes after block search

2.8 Axis-specific bits (max. 5 axes) (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
560* 2)	Actual value display modulo 360°	Automatic ref. point approach	Software lim. switch active	No start inhibit for ref. point	Rounding for rotary axis	Rounding to whole/half degrees		No meas.circuit monitoring
564* 2)	Axis exists	Fictitious axis	Rotary axis			Actual value sign change	Setpoint sign change	Ref. point in neg. dir.
568*			Axis name					
572*				Rotary axis 3) Full/semi-circle prog.	Mirror image TO, plane axis	Mod. 360° programmed	Plane axis	Mirror zero offset with "Mirror axis"
576*	Number of duplicator axis							
580*		Axis with dist.-coded ref. marks		Pos. value module when starting	Absolute offset valid	Meas. sys. in opp. dir. to mach. sys.		
584*	Display resolution					Position control resolution		

1) The value of this defined data must be 0.
2) MD 560 bit 7 active only for rotary axis, MD 564* bit 7 active only after Power On.*
3) MD 572 bit 4 active only in conjunction with bit 2.*

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2.9 Compensation flags for leadscrew error compensation (Softkey MACHINE BITS)

MD No.	Bit No. 7	6	5	4	3	2	1	0
6000	Comp. point 4		Comp. point 3		Comp. point 2		Comp. point 1	
	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –
6001	Comp. point 8		Comp. point 7		Comp. point 6		Comp. point 5	
	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –

.
.
.

6248	Comp. point 996		Comp. point 995		Comp. point 994		Comp. point 993	
	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –
6249	Comp. point 1000		Comp. point 999		Comp. point 998		Comp. point 997	
	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –	yes / no	+ / –

– = 0 no = 0
\+ = 1 yes = 1

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2.10 Standard machine data

2.10.1 General bits

MD No.	SINUMERIK 810/820M								SINUMERIK 810/820T							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
5000	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0
5001	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1
5002	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
5003	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
5004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5007	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
5008	810 0 820 0	1 1	0 0	0 0	0 0	0 0	0 1	1 0	810 0 820 0	1 1	0 0	0 0	0 0	0 0	0 1	1 0
5009	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
5010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5011	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
5012	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
5013	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5014	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1
5015	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
5016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5040	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5041	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5044	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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2.10.2 Spindle-specific bits

MD No.	SINUMERIK 810/820M								SINUMERIK 810/820T							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
5200	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
5201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5210	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
5211	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2.10.3 Channel-specific bits

MD No.	SINUMERIK 810/820M								SINUMERIK 810/820T							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
540*	0	0	0	0	0	0	0	1	5400	0	0	0	0	0	1	0	1
									5401	0	0	0	0	0	0	0	1
542*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
544*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
546*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
548*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
550*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
552*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
554*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
556*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
558*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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2.10.4 Axis-specific bits

MD No.	SINUMERIK 810/820M								SINUMERIK 810/820T							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
5600	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
5601	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
5602	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5603	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
5604	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5605	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5606	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5640	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5641	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5642	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5643	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5644	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5645	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5680	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5681	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
5682	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
5683	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5684	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5685	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5686	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5720	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
5721	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5722	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5723	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5724	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5725	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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MD No.	SINUMERIK 810/820M								SINUMERIK 810/820T							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
5760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5761	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5762	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5763	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5764	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5802	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5803	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5804	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5805	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5840	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5841	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5842	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5843	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5844	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5845	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0
5846	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0

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2.11 Input units

- **unit = 2 units of position control resolution (MS reference system)**
  e.g. 1 unit of position control resolution = 1/2 µm (MD 5840 = xxxxx010)
  x . . no significance here
  1 unit (MS) = 1 µm

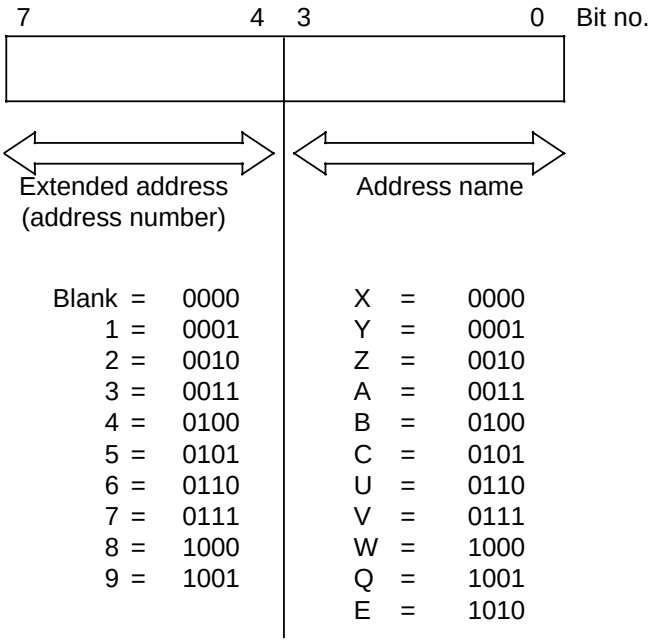
- **unit = 1 unit of input resolution (IS reference system)**
  e.g. 1 unit of input resolution = 1 µm (MD 5002 = x010xxxx)
  x . . no significance here
  1 unit (IS) = 1 µm

- **VELO ... Smallest unit of digital-analog converter (DAC) for setpoint conversion**

  Given a 14-bit DAC then: 1 VELO = $\frac{10}{8192}$ = 1.22 mV

  For digital link, see Section 4.1.

- **Coding of addresses (axis names)**



Blank	=	0000	X	=	0000
1	=	0001	Y	=	0001
2	=	0010	Z	=	0010
3	=	0011	A	=	0011
4	=	0100	B	=	0100
5	=	0101	C	=	0101
6	=	0110	U	=	0110
7	=	0111	V	=	0111
8	=	1000	W	=	1000
9	=	1001	Q	=	1001
			E	=	1010

Example:
0000 0010 = Z
0001 1001 = Q1

- **MD 240* reference point value:**
  In view of the fact that the reference point value is assigned to the ”MS” reference system, a conversion is necessary for inch input resolution and millimeter interpolation resolution (or vice versa) if a whole value (no digits after the decimal point) is to be displayed after approach to reference point. The conversion factor is 2.54 or 25.4.

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- **Multgain:**

Formula: $\frac{3 * 10^7}{Vmax} \cdot \frac{U_{max}}{10}$

V_{max}: max. speed (1000 units/min)
U_{max}: max. voltage at Vmax (Volt)

Multgain table:

Max. speed (1000 units/min)	Max. set rotary speed 4 Volt	8 Volt	9 Volt
24000	500	1000	1125
22000	545	1090	1227
20000	600	1200	1350
18000	666	1332	1500
16000	750	1500	1687
15000	800	1600	1800
14000	857	1714	1928
12000	1000	2000	2250
10000	1200	2400	2700
8000	1500	3000	3375
6000	2000	4000	4500
5000	2400	4800	5400
4000	3000	6000	6750
3000	4000	8000	9000
2000	6000	12000	13500
1000	12000	24000	27000
750	16000	32000	36000
500	24000	48000	-
375	32000	-	-
187	64000		

The maximum value in multgain is 64000

- **SINUMERIK 810 with configuring capability:**

The following data must be observed when configuring:

MD 5	Number of input buffer EZS parameters
MD 5015 Bit 6	UMS user memory submodule available
”CLEAR USER MEM.”softkey	
”CLEAR PP-MEM.” softkey	
Alarm 5	Too many input buffer parameters
Alarm 10	UMS error
Alarm 11	Incorrect UMS identifier (UMS empty?)
Alarms 3024-3046	Error during configuring with WS800

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- **MD 200* (axis assignment) or MD 400* (spindle assignment) for SPC measuring circuit modules**

Example of the format of a value	Measuring circuit PCB No.	Number of encoder: Actual position	No meaning	
	1	2	0	0

Possible values	Explanation
0000	Axis not available at machine (only permissible with MD 564* bit 7=0 for real axes) or fictitious axis
1100	Measuring circuit 1, encoder 1
1200	Measuring circuit 1, encoder 2
1300	Measuring circuit 1, encoder 3
2100	Measuring circuit 2, encoder 1
2200	Measuring circuit 2, encoder 2
2300	Measuring circuit 2, encoder 3

All other values are **not** allowed and result in errors.

- **MD 200* (axis assignment) or MD 400* (spindle assignment) for HMS measuring circuit modules**

Assignment structure

01 or 02	01 to 03	01 or 02	04 to 12
Number of MC module input	Number of MC connection input	Number of MC module output	Number of MC connection output

Value 0 = axis not available on the machine or fictitious axis.

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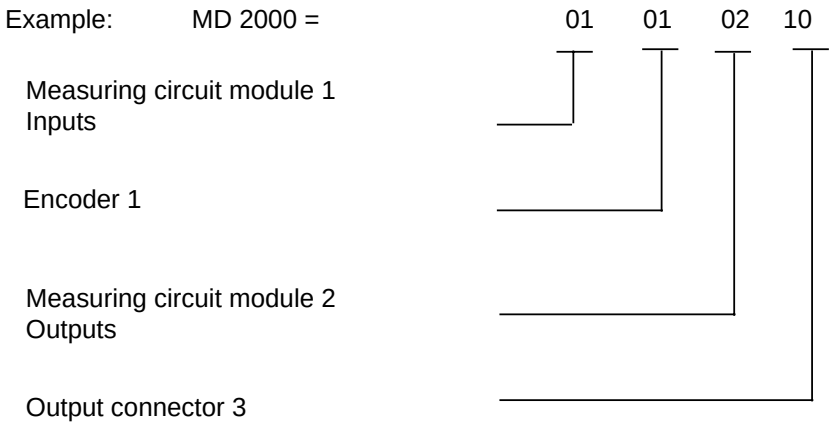


The control automatically recognizes whether data refers to the SPC or the HMS measuring circuit modules from the number of places input.

Input, position control and display resolutions are described in section 10.7 ”Installation Guide”.

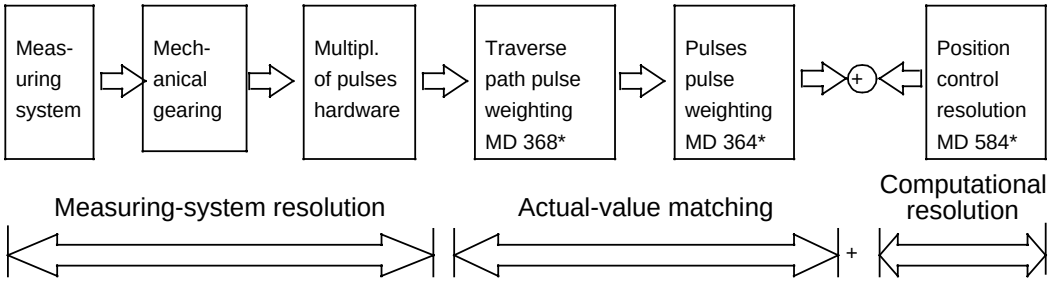
- **Variable pulse weighting (MD 364*, MD 368*)**

  In order to generate a proper closed position control loop the pulses from the digital measuring system and the position control accuracy of the control must be matched to one another.

  To be able to calculate machine data 364* and 368* the number of pulses from the encoder and the corresponding travel on the machine must be known.

  The value for the travel must be entered in MD 368* (position control resolution). The number of pulses from the encoder for this travel multiplied by all the following multiplication factors (EXE, measuring gearing, quadrupling set on the hardware of the measuring circuit module) is entered in MD 364* as long as the values of the machine data are not greater than 65000. In that case both values must be divided by a common multiple.

  Block diagram of position control parameters:



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Determination of possible position control parameters (MD 364* and MD 368*)

– The encoder is mounted directly on the ball screw.

$$\text{MD 368*} = \frac{1}{b} \qquad \text{MD 364*} = p \cdot 4$$

– The encoder is mounted on the motor and gearing is fitted between the motor and ball screw.

$$\text{MD 368*} = \frac{1 \cdot r}{b} \qquad \text{MD 364*} = p \cdot 4$$

– A linear scale with EXE is used.

$$\text{MD 368*} = \frac{g}{b} \qquad \text{MD 364*} = f \cdot 4$$

– A rotary axis is used.

$$\text{MD 368*} = \frac{360 \text{ degrees}}{b} \qquad \text{MD 364*} = p \cdot f \cdot 4$$

Symbol	Machine data	Significance
b	584*	Position control resolution of control.
l		Pitch of ball screw.
p		Number of pulses from encoder per revolution.
r		Mechanical gearing between motor and encoder.
g		Period spacing on a linear scale.
f		EXE multiplier.
MD 364*	364*	Pulses for variable pulse weighting.
MD 368*	368*	Traverse path for variable pulse weighting.

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Examples for determining MD 364* and MD 368*.

– The encoder is mounted directly on the ball screw.

l = 10 mm
p = 2500 pulses per revolution
b = 1/2 10^{-3} mm

$$\text{MD 368*} = \frac{1}{b} = \frac{10\ \text{mm}}{1/2\ 10^{-3}\ \text{mm}} = \mathbf{20000}$$

MD 364* = p · 4 = 2500 · 4 = **10000**

– The encoder is mounted on the motor and gearing is fitted between the motor and ball screw.

l = 0.2 inches
p = 1000 pulses per revolution
r = 1 : 2 (2 revolutions of motor = 1 revolution of the ballscrew)
b = 1/2 10^{-4} inch

$$\text{MD 368*} = \frac{l \cdot r}{b} = \frac{0.2\ \text{inch} \cdot 1/2}{1/2\ 10^{-4}\ \text{inch}} = \mathbf{2000}$$

MD 364* = p · 4 = 1000 · 4 = **4000**

– Same values as for example 2.2. except that b = 1/2 10^{-3} mm

$$\text{MD 368*} = \frac{l \cdot r}{b} = \frac{0.2\ \text{inch} \cdot 25.4\ \text{mm/inch} \cdot 1/2}{1/2\ 10^{-3}\ \text{mm}} = \mathbf{5080}$$

MD 364* = p · 4 = 1000 · 4 = **4000**

– A linear scale with EXE is used.

g = 0.02 mm
f = 10
b = 1/2 10^{-3} mm

$$\text{MD 368*} = \frac{g}{b} = \frac{0.02\ \text{mm}}{1/2\ 10^{-3}\ \text{mm}} = \mathbf{40}$$

MD 364* = f · 4 = 10 · 4 = **40**

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– A rotary axis is used.

p= 18000 pulses per revolution
f = 5
b= 1/2 10^{-3} degrees

$$\text{MD 368*} = \frac{360 \text{ degrees}}{b} = \frac{360 \text{ degrees}}{1/2\ 10^{-3} \text{ degrees}} = 720000$$

MD 364* = p · f · 4 = 18000 · 5 · 4 =**360000**

Since the values exceed 65000, both values must be divided by a common factor (e.g. factor = 100).

MD 368* = **7200** MD 364* = **3600**

- **MD 4590 Number of pulses spindle encoder**

  Number of pulses of the spindle encoder without multiplication. The value affects the maximum possible speed of the spindle.

  Formula for the maximum speed:

$$n_{max} = \frac{60 \cdot n_{limit}}{N}$$

n_{limit} = limit frequency of the encoder in Hz
N = number of pulses per spindle revolution

Example for n_{limit} = 1 MHz

N	n_{max} [1/min]
1024	(58000) 16000 = max
2500	(24000) 16000 = max
5000	12000
9000	6666

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3 PLC Machine Data

3.1 General values

MD No.	Description	Standard value	Maximum value	Input unit
0	No. for interrupt-processing input byte	7	63	-
1	PLC - Processor load percentage (OB 1 + OB 2)	15	20	%
2	PLC call OB 1	0	3	IPO pulse
3	Max. interpreter run time (PLC driven)	2000	2500	µs
4				
5	Cycle monitoring	70	320	ms
6	No. of last S-5 time	15	31	-
7				
8	Interface for DB37	1	2	-
9	Selection of K byte for DB range	8	32	1 kbyte
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				

All PLC MD are active only after POWER ON!

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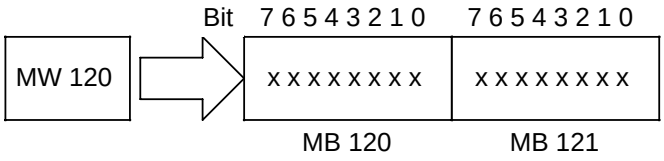
3.2 User data

MD-No.	Description	Standard-value	Max. value BCD/FPZ	Input unit	Transfer to flag word [1]
1000	1st PLC user MD	0	9999/65536	-	MW 120
1001	2nd PLC user MD	0	9999/65536	-	MW 122
1002	3rd PLC user MD	0	9999/65536	-	MW 124
1003	4th PLC user MD	0	9999/65536	-	MW 126
1004	5th PLC user MD	0	9999/65536	-	MW 128
1005	6th PLC user MD	0	9999/65536	-	MW 130
1006	7th PLC user MD	0	9999/65536	-	MW 132
1007	8th PLC user MD	0	9999/65536	-	MW 134
1008					
1009					
1010					
1011					
1012					
1013					
1014					
1015					
1016					
1017					
1018					
1019					

Flag word: A flag word comprises two flag bytes.
e.g. MW 120 = MB 120 + MB 121

PLC status on NC display:



[1] *Max. value: If the value is to be transferred in BCD code (PLC MD 2000) to the flag word, the max. value is 9999.*

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3.3 General bits

MD No.	Bit No. 7	6	5	4	3	2	1	0
2000	PLC MD 1007 BCD-coded	PLC MD 1006 BCD-coded	PLC MD 1005 BCD-coded	PLC MD 1004 BCD-coded	PLC MD 1003 BCD-coded	PLC MD 1002 BCD-coded	PLC MD 1001 BCD-coded	PLC MD 1000 BCD-coded
2001	H no. channel 1 BCD-coded	T no. channel 1 BCD-coded	S no. channel 1 BCD-coded	M no. channel 1/2 BCD-coded			2nd spindle override switch for spindle 2 available	Spindle override switch for spindle 1+ 2 effective
2002 1)	M decod. with extended address		Feed/rap. trav. overr. active axes 3 ... 7 (T)	Connection distributed I/O devices	Transfer m/c control panel I to O image		2nd axis selector switch avail-able (M)	No interrupt processing (OB 2)
2003	Enable of diagnostic function (DB 1)	Segmention of S5 program processing	Demon-stration mode	Enable of S5 system commands		PLC stop if distributed I/O devices faulted	PLC stop if runtime exceeded OB 1+OB 2	PLC stop if runtime exceeded OB 2
2004								
2005								

3.4 User bits

MD No.	Bit No. 7	6	5	4	3	2	1	0
3000	PLC user MD BITS							
3001	PLC user MD BITS							
3002	PLC user MD BITS							
3003	PLC user MD BITS							

Transfer of PLC user MD BITS by operating system after Power On:

PLC MD 3000 MB 116
PLC MD 3001 MB 117
PLC MD 3002 MB 118
PLC MD 3003 MB 119

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4 Digital Link

A digital link as implemented in Basic version 2 is not available.

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5 Setting Data

5.1 General values

SD No.	Description	Standard value	Max. input value	Reference system	Input unit
0	Dry run feedrate	0	44000 1)	IS	1000 units/min
1	Dynamic smoothing time, thread	0	5		
2					

5.2 Channel-specific values

SD No.	Description	Standard value	Max. input value	Reference system	Input unit
200*	Scaling factor	1	99.99999		

5.3 Axis-specific values (max. 5 axes)

SD No.	Description	Standard value	Max. input value	Reference system	Input unit
300*	Min. working area limitation	0	+/-99999999	IS	units
304*	Max. working area limitation	0	+/-99999999	IS	units
308*	Handwheel assignment	0	0...3		
312*	Scaling centre	0	+/-99999999	IS	units

5.4 Spindle-specific values (max. 2 spindles)

SD No.	Description	Standard value	Max. input value	Reference system	Input unit
400*					
401*	Prog. spindle speed limitation 1)	0	16000		rev/min
402*	Oriented spindle stop	0	359.9		degrees
403*	Spindle speed limitation	0	16000		rev/min
403*	Smoothing constant thread	0	5	---	---

1) dependent on NC MD 155

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5.5 General bits

SD No.	Bit No. 7	6	5	4	3	2	1	0
5000 1)						Std. cycles as from UMS 03 function expansion		
						Turning cycles	Drilling and milling patts.	Drilling cycles
5001								Display in-process actual value system
5002				Program overview with 1st comment				

5.6 Bits for 1st serial interface

SD No.	Bit No. 7	6	5	4	3	2	1	0
5010	Device identifier 1st interface, read in							
5011	Transmission format 1st interface, read in							
	Number of stop bits		Odd parity	With parity	Baud rate			
5012	Device identifier 1st interface, read out							
5013	Transmission format 1st interface, read out							
	Number of stop bits		Odd parity	With parity	Baud rate			
5014	Xon start character 1st interface (value e.g.. 11H)							
5015	Xoff start character 1st interface (value e.g.. 93H)							
5016	Special bits 1st interface							
	Start without Xon	Progr. start with LF	Block end with CR LF	Output in EIA code	Stop with EOT character	Assess availability	No leader or trailer during output	Read in program from System 3/8
5017	Special bits 1st interface							
						No output of NC MD with 0	No REORG via interface	Time watchdog off

1) SD 5000, Bit 0, 1, 2 = "1" ... Cycle function extension can be used by UMS as from release 03
Bit 0, 1, 2 = "0" ... Cycle function as UMS release 02 (compatible mode)

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5.7 Bits for 2nd serial interface

SD No.	Bit-No. 7	6	5	4	3	2	1	0
5018	Device identifier 2nd interface, read in							
5019	Device identifier 2nd interface, read in Number of stop bits		Odd parity	With parity	Baud rate			
5020	Device identifier 2nd interface, read out							
5021	Device identifier 2nd interface, read out Number of stop bits		Odd parity	With parity	Baud rate			
5022	Xon start character 2nd interface (value e.g. 11H)							
5023	Xoff stop character 2nd interface (value e.g. 93H)							
5024	Special bits 2nd interface Start without Xon	Progr. start with LF	Block end with CR LF	Output in EIA code	Stop with EOT character	Assess availability	No leader or trailer during output	Read in program from System 3/8
5025	Special bits 2nd interface					No output of NC MD with 0	No REORG via interface	Time watchdog off

5.8 Common bits

SD No.	Bit No. 7	6	5	4	3	2	1	0
5026	EIA code for "@" (value e.g.. 6DH)							
5027	EIA code for ":" (value e.g.. 46H)							
5028	End of transmission character (value 03H)							
5029	EIA code for "="							

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5.9 Table for standard devices

Baud rate table:

Bit No..				Baud rate
3	2	1	0	
0	0	0	0	110 baud
0	0	0	1	150 baud
0	0	1	0	300 baud
0	0	1	1	600 baud
0	1	0	0	1200 baud
0	1	0	1	2400 baud
0	1	1	0	4800 baud
0	1	1	1	9600 baud

Setting data for PLC programmer (PG 615, PG 670, PG 675, PG 685)

5010	5011
00000100	xxxxx111

Examples for the setting data necessary for linking with other devices.

Setting data for interfaces							
1st interface	**5010**	**5011**	**5012**	**5013**	**5014**	**5015**	**5016**
2nd interface	**5018**	**5019**	**5020**	**5021**	**5022**	**5023**	**5024**
PG 675/685 (CP/M 86 1200 baud) (V.24 9600 baud)	00000000	11000100 or 11000111	00000000	11000100 or 11000111	xxxxxxxx	xxxxxxxx	xx1x1xxx
GNT reader (option B 02/B 03)	00000000	11000111	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000000
Siemens reader (Fanuc)	00000010	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
Fanuc hand-held reader	00000001	11000110	xxxxxxxx	xxxxxxxx	00010001	10010011	00000000
PT80 300 baud	00000000	11000010	00000000	11000010	xxxxxxxx	xxxxxxxx	00000000
PT88 9600 baud V.24 (RS 232C)	xxxxxxxx	xxxxxxxx	00000000	11000111	xxxxxxxx	xxxxxxxx	00000000

x = can be selected (0 or 1)

Note:

With ISO, EVEN parity must be coded in the user-definable special character Xon and Xoff, and with EIA, ODD parity.

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5.10 Axis-specific bits

SD No.	Bit No. 7	6	5	4	3	2	1	0
560*						Enable change of scaling		
562*								

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6 PLC Signals

6.1 External machine control panel

SINUMERIK 810/820T								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
IB 0	Spindle override switch				Mode selector			
	D	C	B	A	D	C	B	A
IB 1	Direction keys		Rapid trav override	Direction keys		Aux. axis *Q2 / Q1	Handwheel Z/X/Q	
	X +	X –		Q +	Q –			
IB 2	Direction keys		Spindle		Feed			
	Z +	Z –	On	*Off	On	*Off	NC Start	*NC Stop
IB 3		Key-oper. switch		Feedrate override switch				
	Reset		Single block	E	D	C	B	A
IB 4	Spindle 2			2nd spindle override switch				
	On	Off			D	C	B	A
IB 99	X +	X –	Z +	Z –	Q1 +	Q1 –	Q2 +	Q2 –
IB 100	Handwheel 1							
	X	Z	Q1	Q2				
IB 101	Handwheel 2				Handwheel 3			
	X	Z	Q1	Q2	X	Z	Q1	Q2

IB 99 IB 101 contain the decoded signals of axes 1 ... 4.

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SINUMERIK 810M								
Byte No.	Bit No. 7	6	5	4	3	2	1	0
IB 0	Spindle override switch D	C	B	A	Mode selector D	C	B	A
IB 1	Direction keys 1 X +	X –	Rapid traverse	(E)	Axis selector switch 1 (D)	C	B	A
IB 2			Spindle on	*off	Feed on	*off	NC-Start	*NC-Stop
IB 3	Reset	Key switch	Single block	E	Feedrate override switch D	C	B	A
IB 4	Option Direction keys 2 +	–	Option Rapid traverse	(E)	Option Axis selector switch 2 (D)	C	B	A
IB 4	Spindle 2 On	*Off			2nd spindle override switch D	C	B	A
IB 92	Direction keys +	–				For axis 7 Handwheel 3	Handwheel 2	Handwheel 1
IB 93	Direction keys +	–				For axis 6 Handwheel 3	Handwheel 2	Handwheel 1
IB 94	Direction keys +	–				For axis 5 Handwheel 3	Handwheel 2	Handwheel 1
IB 99	Direction keys X +	X –	Y +	Y –	Z +	Z –	4. +	4. –
IB 100	Handwheel 1 X	Y	Z	4.	Handwheel (Axis selector switch 2) X	Y	Z	4.
IB 101	Handwheel 2 X	Y	Z	4.	Handwheel 3 X	Y	Z	4.

The various possible occupations of IB 4 are specified via machine data.

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6.2 Integrated machine control panel

SINUMERIK 810T

Byte No.	Bit No. 7	6	5	4	3	2	1	0
IB 95	Spindle override switch D	C	B	A	Mode selector D	C	B	A
IB 96			Rapid traverse					
IB 97			Spindle On	*Off	Feed On	*Off	NC Start	*NC Stop
IB 98	Reset		Single block	E	Feedrate override switch D	C	B	A
IB 99	Direction keys X +	X –	Z +	Z –	Q1 +	Q1 –	Q2 +	Q2 –
IB 100	Handwheel 1 X	Z	Q1	Q2				
IB 101	Handwheel 2 X	Z	Q1	Q2	Handwheel 3 X	Z	Q1	Q2

SINUMERIK 810M

Byte No.	Bit No. 7	6	5	4	3	2	1	0
IB 95	Spindle override switch D	C	B	A	Mode selector D	C	B	A
IB 96			Rapid traverse					
IB 97			Spindle On	*Off	Feed On	*Off	NC Start	*NC Stop
IB 98	Reset		Single block	E	Feedrate override switch D	C	B	A
IB 99	Direction keys X +	X –	Y +	Y –	Z +	Z –	4. +	4. –
IB 100	Handwheel 1 X	Y	Z	4.				
IB 101	Handwheel 2 X	Y	Z	4.	Handwheel 3 X	Y	Z	4.

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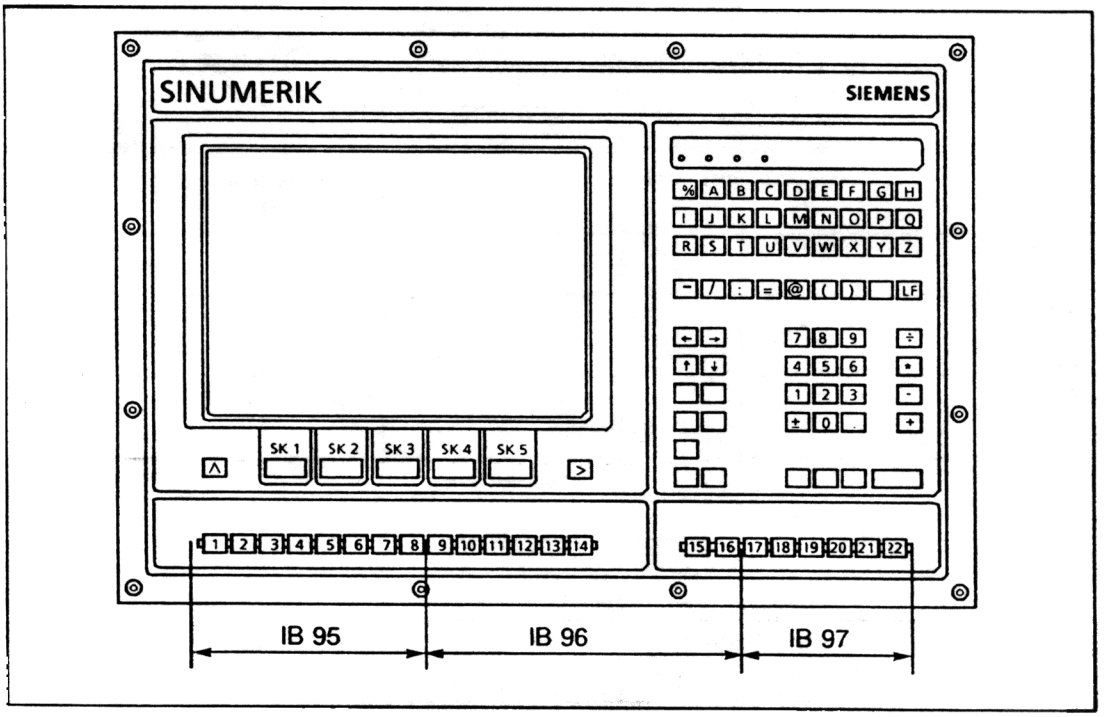
6.2.1 Integrated operator panel

SINUMERIK 810T and 810M								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
IB 95	Key 17	Key 16	Key 15	Key 14	Key 13	Key 12	Key 11	Key 10
IB 96	Key 27	Key 26	Key 25	Key 24	Key 23	Key 22	Key 21	Key 20
IB 97	Key 37	Key 36	Key 35	Key 34	Key 33	Key 32	Key 31	Key 30

SINUMERIK 820T and 820M								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
IB 95	Key 8	Key 7	Key 6	Key 5	Key 4	Key 3	Key 2	Key 1
IB 96	Key 16	Key 15	Key 14	Key 13	Key 12	Key 11	Key 10	Key 9
IB 97			Key 22	Key 21	Key 20	Key 19	Key 18	Key 17



Key numbering of the freely assignable keyboard on the SINUMERIK 820 operator panel

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6.3 NC/PLC interface

6.3.1 PLC input signals NC PLC

Submodes								
Byte No.	Bit No. 7	6	5	4	3	2	1	0
IB 103 Channel 1	Transform-ation is active			G36 active				
IB 104 Channel 1	Delete block		DEC - single block	Dry run feed	M 01 active	Rap. trav. override active	DRF selected	BTR selected
IB 109 Channel 2				G36 active				
IB 110 Channel 2	Delete block		DEC - single block	Dry run feed	M 01 active	Rap. trav. override active	DRF selected	
IB 107 Channel 1		Block search active						
IB 113 Channel 2		Block search active						

Program commands								
Byte-No.	Bit No. 7	6	5	4	3	2	1	0
IB 102 Channel 1	M 00 / M 01	M 02 / M 30	G 33 / G 63	G 00	G 96		Program inter-rupted	Program running
IB 108 Channel 2	M 00 / M 01	M 02 / M 30	G 33 / G 63	G 00	G 96		Program inter-rupted	Program running

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Axis-specific signals								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
IB 118 1st axis		Axis in position control		Reference point reached	Travel command +	Travel command –	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 119 1st axis	Axis in duplication							
IB 120 2nd axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 121 2nd axis	Axis in duplication							
IB 122 3rd axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 123 3rd axis	Axis in duplication							
IB 124 4th axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 125 4th axis	Axis in duplication							
IB 126 5th axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 127 5th axis	Axis in duplication							
IB 86 6th axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 87 6th axis	Axis in duplication							
IB 88 7th axis		Axis in position control		Reference point reached	Travel command +	Travel command -	Position reached Exact positioning fine	Position reached Exact positioning coarse
IB 88 7th axis	Axis in duplication							

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Spindle signals								
Byte No.	**Bit No.**							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
IB 114 Spindle 1	Actual spindle rotation clockwise	Programmed speed too high	Spindle in specified range	Spindle position reached	Spindle stationary	Spindle synchronized	M 19 active	Speed limit exceeded
IB 115 Spindle 1	Change gear					Specified reduction stage C	B	A
IB 116 Spindle 2	Actual spindle rotation clockwise	Programmed speed too high	Spindle in specified range	Spindle position reached	Spindle stationary	Spindle synchronized	M 19 active	Speed limit exceeded
IB 117 Spindle 2	Change gear					Specified reduction stage C	B	A

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6.3.2 PLC output signals PLC NC

Axis-specific signals								
Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB 108	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	–
1st axis	Jog travel command		Rapid traverse override		Axis inhibit	3.	2.	1.
QB 109	+	–				active	Handwheel active	active
QB 112	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	-
2nd axis	Jog travel command		Rapid traverse override		Axis inhibit	3.	2.	1.
QB 113	+	-				active	Handwheel active	active
QB 116	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	-
3rd axis	Jog travel command		Rapid traverse override		Axis inhibit	3.	2.	1.
QB 117	+	-				active	Handwheel active	active
QB 120	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	-
4th axis	Jog travel command		Rapid traverse override		Axis inhibit	3.	2.	1.
QB 121	+	-				active	Handwheel active	active
QB 124	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	-
5th axis	Jog travel command		Rapid traverse override		Axis inhibit	3.	2.	1.
QB 125	+	-				active	Handwheel active	active

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Axis-specific signals

Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB 70	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	–
6th axis	Jog travel command		Rapid traverse override		Axis inhibit	3rd	2nd	1st
QB 71	+	–				active	Handwheel active	active
QB 74	Mirror image	Follow-up operation	Feed enable	*Deceler-ation	Positioning axis	Servo enable	Software limit switch 2 active +	-
2nd axis	Jog travel command		Rapid traverse override		Axis inhibit	3rd	2nd	1st
QB 75	+	-				active	Handwheel active	active

Spindle influencing spindle 1 1)

Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB 100	Spindle enable	Servo enable	Specify zero setpoint	Spindle override active	D	Spindle override C	B	A
QB 101	Initiate C axis operation		Spindle reset	Invert M 03 / M 04	Automatic gear selection	Actual gear C	B	A
QB 102						Channel No. for spindle	B	A
QB 103	Specified rotation clockwise	Reciprocat. speed	Set speed	Position spindle	Resynchr. spindle	Acknow-ledge M 19		PLC spindle control

Spindle influencing spindle 2 2)

Byte No.	Bit No. 7	6	5	4	3	2	1	0
QB 104	Spindle enable	Servo enable	Specify zero setpoint	Spindle override active	D	Spindle override C	B	A
QB 105	Initiate C axis operation		Spindle reset	Invert M 03 / M 04	Automatic gear selection	Actual gear C	B	A
QB 106						Channel No. for spindle	B	A
QB 107	Specified rotation clockwise	Reciprocat. speed	Set speed	Position spindle	Resynchr. spindle	Acknow-ledge M 19		PLC spindle control

1) QB 101.4 (invert spindle speed) does not act with M19 and reciprocating speed.

2) QB 101.5 (spindle reset) acts only in program reset states.

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Stand-by signals								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
QB 78	Blanking of screen	Key-oper. switch	Data in start (2nd inter-face)	Data in start (1st inter-face)	Cycle inhibit		*Emergency stop	

Modes/Program control								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
QB 81 Channel 1					Axis duplication			
					WZS 2	WZS 1		
QB 82 Channels 1 and 2	DRF active	Reset				Modes		
					D	C	B	A
QB 83 Channel 1	Delete block	Single block	DEC - single block	Dry run feed	M 01 active			
QB 92 Channel 2	Delete block	Single block	DEC - single block	Dry run feed	M 01 active			
QB 87 Channel 1			Read-in enable		Clear distance to go	Clear subroutine repetition no.	NC Stop	NC Start
QB 96 Channel 2			Read-in enable		Clear distance to go	Clear subroutine repetition no.	NC Stop	NC Start

Feedrate influencing								
Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
QB 84	Overall feed enable		Feedrate override active	Feedrate override				
				E	D	C	B	A
QB 85			Rapid traverse override active	Rapid traverse override				
				(E)	(D)	C	B	A

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6.4 System signals

Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 0	Flashing frequency 1 Hz				Channel No. [1]		Always one	Always zero
FB 1						Current OB number		
FB 2						Basic position OB 2	OB 1	
FB 3						Restart OB 2	OB 1	OB 20
FB 6						Processing delay OB 2		
FB 8								Group error I/O devices 2)
FB 12	Negative signal edge Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
FB 16	Positive signal edge Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0

FB 0	Bit 3	Bit 2
Display channel 1	0	1
Display channel 1	1	0
Display channel 1	1	1

1) Display of selected channel

2) This flag is set if the PLC does not go into the STOP state on a PLC error. (Evaluate DB 11, DW 8).

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6.5 NC-PLC user interface

Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 19	Number of total blocks (Hex.) of the 1st program in the ring buffer							
FB 20								
FB 19	Number of total blocks (Hex.) of the 1st program in the ring buffer							
FB 20								
FB 23	ring buffer full	ring buffer empty						V.24 running
FB 24	Probe 2 active	Probe 1 active			NC Ready 2	Static 1 signal	Battery fault	NC alarm
FB 25			H modific.	T modific.	S modific.	M word 3 modific.	M word 2 modific.	M word 1 modific.
FB 26	Last aux. function in block					M word 3 not decoded	M word 2 not decoded	M word 1 not decoded

Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 27	Dynamic M signals							
	M 07	M 06	M 05	M 04	M 03	M 02	M 01	M 00
FB 28	Static M signals							
	M 07	M 06	M 05	M 04	M 03	M 02	M 01	M 00
FB 29	Dynamic M signals							
	M 15	M 14	M 13	M 12	M 11	M 10	M 09	M 08
FB 30	Static M signals							
	M 15	M 14	M 13	M 12	M 11	M 10	M 09	M 08
FB 31	Dynamic M signals							
	M 23	M 22	M 21	M 20	M 19	M 18	M 17	M 16
FB 32	Static M signals							
	M 23	M 22	M 21	M 20	M 19	M 18	M 17	M 16
FB 33	Dynamic M signals							
	M 31	M 30	M 29	M 28	M 27	M 26	M 25	M 24
FB 34	Static M signals							
	M 31	M 30	M 29	M 28	M 27	M 26	M 25	M 24
FB 35	Dynamic M signals							
	M 39	M 38	M 37	M 36	M 35	M 34	M 33	M 32
FB 36	Static M signals							
	M 39	M 38	M 37	M 36	M 35	M 34	M 33	M 32
FB 37	Dynamic M signals							
	M 47	M 46	M 45	M 44	M 43	M 42	M 41	M 40

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Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 38	Static M signals							
	M 47	M 46	M 45	M 44	M 43	M 42	M 41	M 40
FB 39	Dynamic M signals							
	M 55	M 54	M 53	M 52	M 51	M 50	M 49	M 48
FB 40	Static M signals							
	M 55	M 54	M 53	M 52	M 51	M 50	M 49	M 48
FB 41	Dynamic M signals							
	M 63	M 62	M 61	M 60	M 59	M 58	M 57	M 56
FB 42	Static M signals							
	M 63	M 62	M 61	M 60	M 59	M 58	M 57	M 56
FB 43	Dynamic M signals							
	M 71	M 70	M 69	M 68	M 67	M 66	M 65	M 64
FB 44	Static M signals							
	M 71	M 70	M 69	M 68	M 67	M 66	M 65	M 64
FB 45	Dynamic M signals							
	M 79	M 78	M 77	M 76	M 75	M 74	M 73	M 72
FB 46	Static M signals							
	M 79	M 78	M 77	M 76	M 75	M 74	M 73	M 72
FB 47	Dynamic M signals							
	M 87	M 86	M 85	M 84	M 83	M 82	M 81	M 80
FB 48	Static M signals							
	M 87	M 86	M 85	M 84	M 83	M 82	M 81	M 80
FB 49	Dynamic M signals							
	M 95	M 94	M 93	M 92	M 91	M 90	M 89	M 88
FB 50	Static M signals							
	M 95	M 94	M 93	M 92	M 91	M 90	M 89	M 88
FB 51	Dynamic M signals							
					M 99	M 98	M 97	M 96
FB 52	Static M signals							
					M99	M 98	M 97	M 96

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Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 53								
FB 54	Extended M address							
			10^1			10^0		
FB 55								
			10^3			10^2		
FB 56	M word 1							
			10^1			10^0		
FB 57								
FB 58	Extended M address							
			10^1			10^0		
FB 59								
			10^3			10^2		
FB 60	M word 2							
			10^1			10^0		
FB 61								
FB 62	Extended M address							
			10^1			10^0		
FB 63								
			10^3			10^2		
FB 64	M word 3							
			10^1			10^0		

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Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 65								
FB 66	Extended S address							
		10^1				10^0		
FB 67								
		10^7				10^6		
FB 68				S word				
		10^5				10^4		
FB 69								
		10^3				10^2		
FB 70								
		10^1				10^0		
FB 71								
FB 72								
FB 73								
		10^7				10^6		
FB 74				T word				
		10^5				10^4		
FB 75								
		10^3				10^2		
FB 76								
		10^1				10^0		
FB 77								
FB 78								
FB 79								
		10^7				10^6		
FB 80								
		10^5		H word		10^4		
FB 81								
		10^3				10^2		
FB 82								
		10^1				10^0		
FB 83								
FB 84								
FB 85								
FB 86								

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Flag byte No.	Bit No.							
	7	6	5	4	3	2	1	0
FB 87								
FB 88								
FB 89								
FB 90								
FB 91								

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6.6 M functions with extended address

Flag byte No.	Bit No. 7	6	5	4	3	2	1	0
FB 92	Dynamic M signals							
FB 93	Static M signals							
FB 94	Dynamic M signals							
FB 95	Static M signals							
FB 96	Dynamic M signals							
FB 97	Static M signals							
FB 98	Dynamic M signals							
FB 99	Static M signals							

Available: 32 dynamic and static extended M functions. Assignment of flag bits via decoder list in the DB 80.

	Extended M address (DB 80)	M address (DB 80)	PLC bit address (DB 80)	
	0-99 (KF)	0-9999 (KF)	FB no. 93-99 (KY)	Bit no. 0-7 (KY) (stat. bit)
1st value	DW 0	DW 1	DL 2	DR 2
2nd value	DW 3	DW 4	DL 5	DR 5
32nd value	DW 93	DW 94	DL 95	DR 95

Note:

For every extended M function, 3 data words are needed in DB 80.

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6.7 PLC error messages

Error messages (alarms)								
Flag byte No.	Bit No.							
	7	6	5	4	3	2	1	0
FB 100	6007	6006	6005	6004	6003	6002	6001	6000
FB 101	6015	6014	6013	6012	6011	6010	6009	6008
FB 102	6023	6022	6021	6020	6019	6018	6017	6016
FB 103	6031	6030	6029	6028	6027	6026	6025	6024
FB 104	6039	6038	6037	6036	6035	6034	6033	6032
FB 105	6047	6046	6045	6044	6043	6042	6041	6040
FB 106	6055	6054	6053	6052	6051	6050	6049	6048
FB 107	6063	6062	6061	6060	6059	6058	6057	6056

Status messages								
Flag byte No.	Bit No.							
	7	6	5	4	3	2	1	0
FB 108	7007	7006	7005	7004	7003	7002	7001	7000
FB 109	7015	7014	7013	7012	7011	7010	7009	7008
FB 110	7023	7022	7021	7020	7019	7018	7017	7016
FB 111	7031	7030	7029	7028	7027	7026	7025	7024
FB 112	7039	7038	7037	7036	7035	7034	7033	7032
FB 113	7047	7046	7045	7044	7043	7042	7041	7040
FB 114	7055	7054	7053	7052	7051	7050	7049	7048
FB 115	7063	7062	7061	7060	7059	7058	7057	7056

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6.8 PLC machine data

Flag byte No.	PLC MD	Machine data							
FB 116	**MD 3000**	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
FB 117	**MD 3001**	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
FB 118	**MD 3002**	Bit 23	Bit 21	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
FB 119	**MD 3003**	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
FB 120	**MD 1000**				Word 1				
FB 121									
FB 122	**MD 1001**				Word 2				
FB 123									
FB 124	**MD 1002**				Word 3				
FB 125									
FB 126	**MD 1003**				Word 4				
FB 127									
FB 128	**MD 1004**				Word 5				
FB 129									
FB 130	**MD 1005**				Word 6				
FB 131									
FB 132	**MD 1006**				Word 7				
FB 133									
FB 134	**MD 1007**				Word 8				
FB 135									

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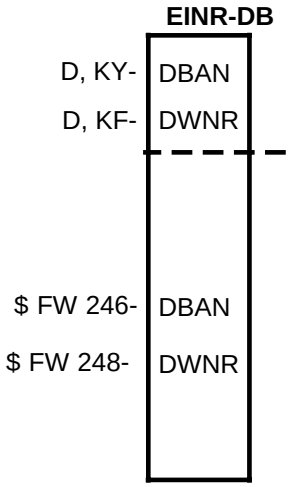
6.9 Description of the function blocks (FB)

The function blocks for tool management, integrating auxiliary axes and workshop UMS are described in the associated planning guides.

6.9.1 Function block FB 11

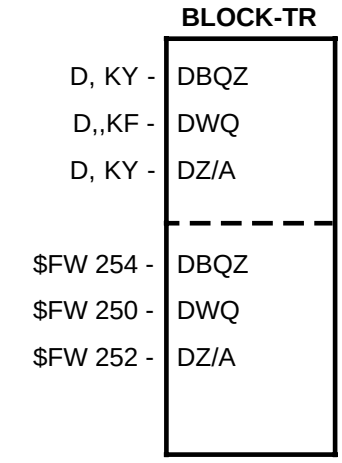


Meaning of error numbers in Accu 2		
%2	. .	DB No. is greater than 255
%3	. .	Specified DW No. less than 0
%4	. .	Length of DBs to be created not equal to DBs in the PLC
%5	. .	Memory area for DBs in the PLC not large enough
%6	. .	DW number specified greater than 255
%7	. .	DB 0 cannot be created

Parameter description of function block FB 11

DBAN DB number and quantity of data blocks to be created.
High byte: DB No.
Low byte: Quantity of data blocks (at least 1).
DWNR No. of the last DW up to which the DB is to be created.

6.9.2 Function block FB 60



Meaning of error numbers in Accu 2		
%1	. .	Quantity of DW to be transferred is greater than 128
%2	. .	Quantity of DW to be transferred = 0
%3	. .	Source DB missing
%4	. .	Destination DB missing
%5	. .	Destination DB is too short
%6	. .	Destination DB in the EPROM
%7	. .	Source DB is too short

Parameter description of function block FB 60

DBQZ No. of the source and destination DBs
High byte: source DB Low byte: destination DB
DWQ No. of the first data word in the source DB
DZ/A No. of the first data word in the destination DB/quantity of data words to be copied

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6.9.3 Function blocks FB 61, FB 62: External data input

FB 61:

NCD-LESE

I, BI	--	LESE	
I, BY	--	NSBY	
D, KF	--	ANZ	
D, KC	--	DTY1	
D, KC	--	DTY2	
D, KC	--	DTY3	
D, KF	--	WER1	
D, KF	--	WER2	
D, KF	--	WER3	
D, KC	--	ZFPN	
D, KY	--	ZIEL	Error no.
$FB 242	--	NSBY	%0
$FB 243	--	ANZ	%1
$FW 244	--	WER1	%2
$FW 248	--	WER2	%3
$FW 250	--	WER3	%4
$FW 252	--	ZFPN	%5
$FW 254	--	ZIEL	%6
			%7
			%8

FB 62:

NCD-SCHR

I, BI	--	SCHR	
I, BY	--	NSBY	
D, KF	--	ANZ	
D, KC	--	DTY1	
D, KC	--	DTY2	
D, KC	--	DTY3	
D, KF	--	WER1	
D, KF	--	WER2	
D, KF	--	WER3	
D, KC	--	ZFPN	
D, KY	--	QUEL	Error no.
$FB 242	--	NSBY	%0
$FB 243	--	ANZ	%1
$FW 244	--	WER1	%2
$FW 248	--	WER2	%3
$FW 250	--	WER3	%4
$FW 252	--	ZFPN	%5
$FW 254	--	QUEL	%6
			%7
			%8

Meaning of the error numbers in Accu 2 (FB 61 / FB 62)

%0	. .	ANZ greater than 1 illegal
%1	. .	Interface byte NSBY illegal
%2	. .	Addressed data word missing: DB missing or DB No. or FW No. illegal. (DB from 2, FW 136 - 254)
%3	. .	Data type DTY illegal
%4	. .	Parameter ANZ < 0 or > 80
%5	. .	Read illegal / Write illegal (FB 61) (FB 62)
%6	. .	Number format ZFPN illegal
%7	. .	WER3 at ZOA or ZOFA not equal 0 or 1
%8	. .	Read/write NC data per option not enabled

Accu 2=0000 nn mm, with nn=interface byte No. and mm=error No. %0...%8

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Parameter description of function block FB 61 / FB 62

LESE . . Command for data transfer (FB 61)
SCHR . . Command for data transfer (FB 62)
NSBY . . Interface byte from DB 36
ANZ . . . Quantity of data to be transferred
DTY1 . . Data type 2 - ASCII - characters
DTY2 . . Data type 2 - ASCII - characters
DTY3 . . Data type 2 - ASCII - characters
ZFPN . . Number format (BCD, fixed point, bit pattern)
ZIEL . . . Data destination in the PLC
QUEL . . Data source in the PLC

High byte: DB no. 2
Low byte: DW no. (0 - 255)
FB no. (136 - 255)

Table: number format

ZFPN	Meaning
B0/F0	Value without decimal point (e.g. 1234)
B1/F1	Value with decimal point (e.g.1234.)
B2/F2	1 place after decimal point
B3/F3	2 places after decimal point
B4/F4	3 places after decimal point
B5/F5	4 places after decimal point
B6/F6	5 places after decimal point
B7/F7	6 places after decimal point
B8/F8	7 places after decimal point
B9/F9	8 places after decimal point
FA	Linear position value 1)
FB	Circular position value 1)
FC	Linear feed value 1)
FD	Circular feed value 1)
FE	Rotational feed value 1)
FF	Rotary speed value 1)
BG	Value as stored
BI	Bit pattern from FW or DW

1) *In these number formats, depending on the input system (set using a machine data), only the **position** of the decimal point within the dimensionless R parameter value is determined. **NO** check is made for an upper limit.*

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Overview of number formats

BI Bit pattern

Format:
DWn
FWn

DL	DR
unassigned	1 0 1 1 1 0 1 0

For ZFPN: KS BI the value to be read can only be zero or 1

FO Fixed-point number with 32 bits
:
FF

Format:

	DL	DR
DWn/ FWn	31	16
DWn + 1/ FWn + 2	15	0

For every value to be transferred two data or flag words are required.

BO BCD with sign and decimal point
:
B9
BG

Format:

	DL		DR		Sign (SG)
DWn/ FWn	unassigned		SG bit 7	8	SG= 0 pos SG= 1 neg
DWn + 1/ FWn + 2	7	6	5	4	For every value to be transferred three data or flag words are required.
DWn + 2/ FWn + 4	E	3	2	1	

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Table for data transfer NC/COM ◄► PLC data words/flags						
Function description	Data type (DTY1 ... DTY3)	Limit value	Value (WER1 - WER3)	Number format (ZFPN) FB 61 1)	Number format (ZFPN) FB 62 1)	Maximum value of the parameter ANZ 2)
Machine data						
Machine data NC	MDN <Address>	0...4999	1	B0,F0 3)	B0,F0 3)	80
Machine data NC bytes	MDNBY <Address>	5000...9999	1	BI	BI	80
Setting data						
Setting data NC	SEN <Address>	0...4999	1	B0,F0 3)	B0,F0 3)	80
Setting data NC bytes	SENBY <Address>	5000...9999	1	BI	BI	30
Tool corrections						
Tool correction	TOS <range> <D no.> <P no.>	0 1 ... 99 0 - 9	1 2 3	BG B0 ... B9 F0 ... F9	BG B0 ... B9 F0 ... F9	10
Tool correction	TOA <D no.> <P no.>	 1 ... 99 0 ... 9	 1 2		B0 ... B9 F0 ... F9 BG	1
Zero offsets						
Adjustable zero offset (G 54-G 57) coarse/fine	ZOA <Group> <Axis no.> <C/f>	1 ... 4 1 ... 4 0/1	1 2 3	B0 ... B9, F0 ... F9	B0 ... B9, F0 ... F9 BG	1
Programmable zero offset (G 58, G 59)	ZOPR <Group> <Axis no.>	1 ... 2 1 ... 4	1 2	B0 ... B9, F0 ... F9	B0 ... B9, F0 ... F9 BG	1
Adjustable zero offset additive only write coarse/fine	ZOFA <Group> <Axis no.> <C/f>	1 ... 4 1 ... 4 0/1	1 2 3		B0 ... B9, F0 ... F9 BG	1
External zero offset from PLC (G58,G59)	ZOE <Axis no.>	1 ... 4	1	B0 ... B9, F0 ... F9	B0 ... B9, F0 ... F9	1
PRESET offset	ZOPS <Axis no.>	1 ... 4	1	B0 ... B9, F0 ... F9	B0 ... B9, BG,F4	1
Total offset	ZOS <Axis no.>	1 ... 4	1	B0 ... B9, BG,F0		1

1) If no number format is specified no data transfer is possible from the corresponding function block (FB).

2) If a data type has more than one WERT parameter, the quantity is in the line containing the WERT parameter which is to be incremented.
Quantity > 1 is only possible under the following conditions:
- *Data block available in the NC **closed**.*
- *PLC source/destination address available with sufficient length:*
  for B0...B9/BG three words per value
  for F0...FF two words per value
  for BI one word per value

3) Input and output is effected using the format of the machine/setting data.

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Continued:	**Table for data transfer NC/COM PLC data words/flags**					
Function description	Data type (DTY1 ... DTY3)	Limit value	Value (WER1 - WER3)	Number format (ZFPN) FB 61 1)	Number format (ZFPN) FB 62 1)	Maximum value of the parameter ANZ 2)
Actual values						
Axis position actual workpiece oriented	ACPW <Axis no.>	1 ... 4	1	B0 ... B9/ BG, F0		1
Axis position actual machine oriented	ACPM <Axis no.>	1 ... 4	1	B0 ... B9/ BG, F0		1
External setpoints						
External contour feed	EXBF <Chan. no.> <lin/ rev.>	1 ... 2 0 /1	1 2	B0 F4	B0...B4 F4	1
Program data 3)						
Program pointer for present block	PP <Chan. no.> <plain>	1 ... 2 0 ... 3	1 2	B0 /F0		1
Program selection						
Selection of an NC program	INITMP <Chan. no.>	1 ... 2	1		B0,F0	1
Selection of an NC subroutine	INITSP <Chan. no.>	1 ... 2	1		B0,F0	1
R parameters						
R parameter NC channel	RPNC <Chan. no.> <Paramet.>	1 ... 2 0 ... 499	1 2	B0 ... B9, F0 ... FF BG, BI	B0 ... B9, F0 ... FF BG, BI	80
R parameter central	RPNC <Chan. no.> <Paramet.>	0 900 ... 999	1 2	B0 ... B9, F0 ... FF BG, BI	B0 ... B9, F0 ... FF BG, BI	80
NC error No.						
Read NC alarms	NCAL		0	B0, F0		127

1) If no number format is specified no data transfer is possible from the corresponding function block (FB).

2) If a data type has more than one WERT parameter, the quantity is in the line containing the WERT parameter which is to be incremented.
Quantity > 1 is only possible under the following conditions:
- *Data block available in the NC **closed**.*
- *PLC- source/destination address available with sufficient length:for B0...B9/BG three words per value*
  for F0...FF two words per value
  for BI one word per value

3) When outputting the program pointer, three items of data are supplied for ANZ = 1:
- *for level 0: Program type (0=no program selected, 1=main program, 2=subroutine)*
- *as from level 1: Subroutine number, number of passes, block number, i.e. for B0, 3x3 flag words or data words are required, and for F0, 3x2 flag words or data words.*

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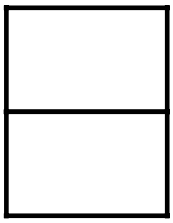
6.9.4 Function block FB 65: M STACK and function block FB 66: STACK M

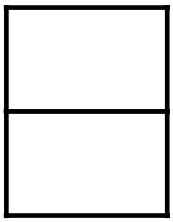
FB 65



Error number ”F1” in Accu 2 means:

Stack pointer overflow on entering flag

FB 66

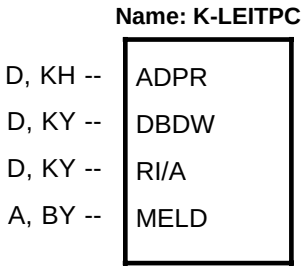


Error number ”F1” in Accu 2 means:

Stack pointer too low on removing flag

Note: Maximum nesting depths = 8. If nesting depth >8, PLC alarm 6114 appears

6.9.5 Function block FB 190



Parameter description of function block FB 190

ADPR Initial address in the DUAL PORT RAM: is not evaluated! (This is on the SIMATIC side only for reasons of compatibility to the FB 190)

DBDW High byte: Data block number
Low byte: Number of initial word and at the same time initial address in the link area

RI/A High byte: Transfer direction
0 = Transfer in direction of link area
1 = Transfer in direction of data block
Low byte: Quantity of words to be transferred (<127)

MELD Error messages: 1 Interface fault
(PLC does not change to STOP)
2 DB not available
3 DB too small
4 DB in EPROM
5 0 < data value > 127
6 Wrong direction
255 No fault (FF)

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6.10 Description of the data blocks

6.10.1 DB 1: Diagnostics DB

Byte No.	Description
DW 0	Current cycle time in ms
DW 1	Current interpreter run time OB 1 + OB 2 in µs
DW 2	Current interpreter run time only OB 1 in µs
DW 3	Current interpreter run time only OB 2 in µs
DW 4	

Byte No.	Bit No.							
	7	6	5	4	3	2	1	0
DR 8					Modification distributed I/O devices	Overheating in EU	Distributed transfer faulted	EU does not respond

Byte No.	Bit No.							
	15	14	13	12	11	10	9	8
DL 8	M decoding error				Failure of master PLC		Runtime OB 2 exceeded	Runtime OB 1+OB 2 exceeded

Byte No.	Bit No.							
	15	14	13	12	11	10	9	8
DL 9	Activation bit for diagnostics [1)]							

Note:

DW 8 can only be evaluated if the PLC does not go into the STOP state.

1) Activation bit for diagnostics is only effective if PLC-MD 2003 bit 7 = 1.

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Byte No.	Bit No. 7	6	5	4	3	2	1	0
DL 10							Set time	Start time
DR 10	**Clock:** distance to last leap year in years 0=1992							
DL 11	**Clock:** Distance of hundredths of seconds in BCD code e.g. 15:45:30'**00**							
DR 11	**Clock:** Display of seconds in BCD code e.g. 15:45:**30**'00							
DL 12	**Clock:** Display of minutes in BCD code e.g. 15:**45**:30'00							
DR 12	**Clock:** Display of hours in BCD code e.g. **15**:45:30'00							
DL 13	**Clock:** Day of date in BCD code e.g. **09**.11.1992							
DR 13	**Clock:** Month of date in BCD code e.g. 09.**11**.1992							
DL 14	**Clock:** Year of date in BCD code e.g. 09.11.19**92**							
DR 14	**Clock:** Display of day within the year, (1 to 365 or 366) in BCD code						e.g. 03**14**.day	
DL 15							e.g. **03**14.day	
DR 15	**Clock:** Day of week in BCD code (1...7)							

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6.10.2 DB 36: Status data transfer function blocks FB 61/FB 62

DB 36 status data transfer function blocks FB 61 / FB 62									
No. interface byte	Byte No.	15	14	13	12	11	10	9	8
		Bit no.							
		7	6	5	4	3	2	1	0
1	DL 0	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
2	DR 0	Error: Value1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
3	DL 1	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
4	DR 1	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
5	DL 2	Error: Value 1-value 3 / Number format		Message axis inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
62	DR 30	Error: Value1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
63	DL 31	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
64	DR 31	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested
65	DL 32	Error: Value 1-value 3 / Number format		Message access inhibited	Data transfer terminated	Data transfer reserved	Data transfer running	Fifo reserved	Data transfer requested

Note:

- If the PLC goes into the STOP state because of a parameter assignment error the number of the interface byte is entered in the high byte of Accu 2.
- If several jobs are entered in the buffer for data transfer a job bit number 65 is processed before the others.
- Data transfer is performed by function blocks FB 61 (READ) and FB 62 (WRITE).

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6.10.3 DB 37: Interface control

DB 37 Interface control								
DL Byte No. DR	15	14	13	12	11	10	9	8
	Bit No.							
	7	6	5	4	3	2	1	0
DL 0								V.24 (RS232C) running
DR 0								
DL 1	BTR selected					V.24 (RS232C) abort	Data start output	Data start input
DR 1							Error in data transfer	Data transfer ended
DW 2	Data type for data output							
DW 3	Data type for data output							
DW 4	Initial number							
DW 5	End number							
DW 6	Channel number							

Explanations for data words DW 2...DW 6

Data type for data output	Data type DW 2/DW 3		Initial number DW 4	End number DW 5	Channel number DW 6
Data format	KC	ASCII Code	BCD	BCD	BCD
Part program	MPF	4D50 4620	0 ... 9999	0 ... 9999	–
Subroutine	SPF	5350 4620	1 ... 999	1 ... 999	–
Tool offsets	TOA	544F 4120	1 ... 99	1 ... 99	–
R parameter -channel-specific -central	RPA	5250 4120	 0 ... 499 900 ... 999	 0 ... 499 900 ... 999	 1 ... 2 0
NC machine data	TEA1	5445 4131	–	–	–
PLC machine data	TEA2	5445 4132	–	–	–

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Data type for data output	Data type DW 2/DW 3		Initial number DW 4	End number DW 5	Channel number DW 6
Data format	KC	ASCII code	BCD	BCD	BCD
Zero offsets - (G54-G57) - Angular shift	ZOA	5A4F 4120	– – –	– – –	 0 1 ... 2
NC setting data	SEA	5345 4120	–	–	–
PLC text	PCA	5043 4120	6000 ... 6063 7000 ... 7063	6000 ... 6063 7000 ... 7063	–

6.10.4 Software cams (DB 39) (Option)

Interface signals from PLC to NC (Section 4.6)

DL Byte No. / DR	15	14	13	12	11	10	9	8
	Bit No.							
	7	6	5	4	3	2	1	0
DL 0								Strobe value transfer all cam parameter values
DR 0				Strobe for value transfer Cam parameter values				
				5	4	3	2	1
DL 1				Assign cam pair to axis 1				
				5	4	3	2	1
DR 1				Assign cam pair to axis 2				
				5	4	3	2	1
DL 2				Assign cam pair to axis 3				
				5	4	3	2	1
DR 2				Assign cam pair to axis 4				
				5	4	3	2	1
DL 3				Assign cam pair to axis 5				
				5	4	3	2	1
DR 3				Assign cam pair to axis 6				
				5	4	3	2	1
DL 4				Assign cam pair to axis 7				
				5	4	3	2	1
DR 4				reserved				
DL 5								
	R parameter no. for first value (KF) = Start cam parameter block							
DR 5								

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Interface signals from NC to PLC (Section 4.6)

DL Byte No. / DR	15	14	13	12	11	10	9	8
	Bit No.							
	7	6	5	4	3	2	1	0
DL 6							Cam signals from cam pair 5	
							+	–
DR 0	Cam signals from cam pair 4		Cam signals from cam pair 3		Cam signals from cam pair 2		Cam signals from cam pair 1	
	+	–	+	–	+	–	+	–

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6.10.5 Display functions (DB 40)

Interface signals (Section 4.7)								
DL Byte No. DR	15	14	13	12	11	10	9	8
	Bit No.							
	7	6	5	4	3	2	1	0
DL 0								
⋮								
DL 7	Display: Key code from NC							
⋮								
DL 42					X	IBN	AEND	ANNEND
DR 42	Display: Menu number (KF)							
⋮								
DL 51								Start
DR 51	X	EB active				X	Error	OK
DL 52	Order number 1 (KF) (1 ... 14)							
DR 52								
DL 53	Menu number (KF) (1 ... 254)							
DR 53								
DL 54	X							
DR 54	Channel number 0 or 1 ... 3							
DL 55	Inhibit	Strobe key				INPUT	EDIT	CANCEL
DR 55	Key code to NC							
DL 56								Spec RCL
DR 56	Display: Channel number							
DL 57								
⋮								
DR 63								

X = Bits, bytes or words containing an X may not be used.

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7 Alarm List

7.1 NC alarms

Legend for the tables in Sections 7.1.1 to 7.1.5 and Section 7.2

R The error is not program-specific so it is only given an ORD number (**ORD 10** means that this is the 10th error after Power On).

S As these errors occur in the program, so the channel number and block number are indicated after the error number.

Example: 3000 1 N0010	Alarm number 3000 In channel 1 In block 10

Cross ”x” in column ”Interlocking of processing”:	The currently running program is stopped if an error occurs.
Cross ”x” in column ”Interlocking of NC Start”:	In the event of an error the program being executed is interrupted and a new program is prevented from starting.
Cross ”x” in column ”Interlocking of NC Ready 2”:	In the event of an error the NC Ready 2 interface signal is cancelled and, after the times in the corresponding MD have elapsed, the servo enable signals are cancelled. (Servo enable relays in measuring circuit drop out.)

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7.1.1 POWER ON alarms (No. 1 ... 56)

POWER ON alarms can only be reset when the control is switched off and on.

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC Ready2
1	Battery alarm - power supply	R			
2					
3	PLC Stop	R	x	x	x
4	Incorrect unit system	R			
5	Too many input buffer parameters	R			
6					
7	EPROM CHECK error	R		x	x
8	Wrong axis/spindle position		x	x	x
9	Memory too small for UMS	R			
10	UMS error	R			
11	Wrong UMS identifier	R			
12	Part program memory wrongly formatted	R			
13	RAM error on CPU	R		x	x
14	RAM error on memory module	R		x	x
15					

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7.1.2 V.24 (RS 232 C) alarms

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
16	Parity error (RS 232 C)	S			
17	Overflow error (RS 232 C)	S			
18	Frame error (RS 232 C)	S			
19	I/O device not ready (RS 232 C)	S			
20	Format memory for PLC alarm texts (RS 232 C)	S			
21					
22	Time monitoring (RS 232 C)	S			
23	Character parity error (RS 232 C)	S			
24	Invalid EIA character (RS 232 C)	S			
25		S			
26	PP block > 120 characters (RS 232 C)	S			
27	Data input disabled (RS 232 C)	S			
28	Circuit buffer overflow (RS 232 C)	S			
29	Block > 254 characters (RS 232 C)	S			
30	PP memory overflow (RS 232 C)	S			
31	No free PP number (RS 232 C)	S			
32	Data format error (RS 232 C)	S			
33	Different programs same number (RS 232 C)	S			
34	Operator error (RS 232 C)	S			
35	Siemens reader error (RS 232 C)	S			
36	BTR interrupted by computer				
40	Incorrect data in MD 576*	S	X	X	
41	Absolute module	S	X	X	
48	PLC alarm texts not allowed by UMS	S			
87	Illegal software limit switch				

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7.1.3 RESET axis-specific alarms (max. 7 axes)

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
104*	DAC limit reached	S	x	x	
108*	O/flow act. part value (pulse weighting)	S	x	x	x
112*	Clamping monitoring (clamping tolerance)	S	x	x	x
116*	Contour monitoring	S	x	x	x
132*	Control loop hardware (axis)	S	x	x	x
136*	Measuring system dirty (axis)	S	x	x	
148*	+ Software overtravel switch	S	x	x	
152*	- Software overtravel switch	S	x	x	
156*	Set speed too high	S	x	x	x
160*	Drift too high	S		x	
164*					
168*	Servo enable rejected for trav. axis	S	x	x	
172*	+ Working area limit	S	x	x	
176*	- Working area limit	S	x	x	
180*	Axis programmed in both channels	B	x	x	
184*	Stop behind reference cam	S	x	x	
196*	Tracking/positioning for axis	S	x	x	x

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7.1.4 RESET alarms general

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
2000	Emergency stop	S	x	x	
2031	Weighting factor too high (MD 388*)				
2032	Stop during threading	B	x	x	
2033					
2034	Speed reduction area	B			
2035	Programmed speed too high	B			
2036	G 35 thread lead decrease too high	B	x		
2037	Programmed S-value too high	S			
2038	Contour feed too high		x		
2039	Reference point not reached	S			
2040	Block not in memory	S		x	
2041	Program not in memory	B	x	x	
2042	Parity error in memory	B	x	x	
2043	Programming error in transformation	B	x	x	
2046	Block > 120 characters	B	x	x	
2047	Option not available	B	x	x	
2048	Circle end position error (circle centre errror)	B	x	x	
2056	Traverse through transformation centre	B	x	x	
2057	Option thread/rev. feed not available	B	x		
2058	3 D option not available	B	x		
2059	G 92 programming error	B	x		
2060	TO, ZO programming error	B	x		
2061	General programming error	B	x		
2062	Programmed feed wrong/missing	B	x		
2063	Thread lead too high	B	x		
2064	Program error rounding on rotary axis	B	x		

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Continuation: RESET alarms general

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
2065	Overtravel will be reached	B	x		
2066	Thread lead error	B	x		
2067	Max. speed of an axis = 0	B	x		
2068	Programmed position behind working area (G 25/G 26)	B	x		
2069					
2070					
2071					
2072	Incorrect input value (contour definition)	B	x		
2073	No intersection point (contour definition)	B	x		
2074	Incorrect angle value (contour definition)	B	x		
2075	Incorrect radius value (contour definition)	B	x		
2076	Incorrect G 02/G 03 (contour definition)	B	x		
2077	Incorrect block sequence (contour definition)	B	x		
2078	Incorrect input parameter (contour definition)	B	x		
2081	Program block not allowed with GRC/CRC	B	x		
2082	CRC plane not determinable	B	x		
		B			
2087	Program block not allowed in coordinate rotation	B	x		
2152	Spindle speed too high	S	x		
2153	Hardware control loop (spindle)	S	x	x	x
2154	Measuring system contamination (spindle)	S	x	x	
2155	Option M 19 missing	S			

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Continuation: RESET alarms general

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
2160	Illegal scaling factor	B	x	x	
2161	Illegal scaling modification	B	x	x	
2171	Approach not possible	B	x		
2172	Exit not possible	B	x		
2173	Approach/exit plane incorrect	B	x		
2178					
2183	N564* axis is no rotary axis				
2184	M function for C axis invalid				
2189	Undefined transformation	B	x	x	
2190	Transformation axes assigned	B	x	x	
2191	Transformation in zero point	B	x	x	
2192	Axis duplication active		x	x	
2193	No axis expansion possible				
2194	G36 position rotary axis is missing				
225*	Spindle speed too high				
226*	Closed-loop control circuit spindle hardware				
227*	Measuring system dirty (spindle)				
228*	Option M19 missing				

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7.1.5 NC alarms, acknowledgeable (ERASE alarms)

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
3000	General program error	B	x		
3001	Geometry parameters > 5	B	x		
3002	Polar/radius error	B	x		
3003	Invalid address	B	x		
3004	CL800 error	B	x		
3005	Contour definition error	B	x		
3006	Wrong block structure	B	x		
3007	Setting data programming error	B	x		
3008	Subroutine error (M 17 missing, ...)	B	x		
3009	Program disabled	B	x		
3010	Intersection error	B	x		
3011	Too many axes/axis twice	B	x		
3012	Block not in memory	B	x		
3013	Simulation disabled (program running ?)				
3014					
3015					
3016	External data input error	S	x		
3017	Part program no. occurs twice	S	x		
3018	Distance from contour too great (NC-MD 9)	B	x		
3019	2nd RS 232 C option not available	S			
3020	Option not available	B			
3021	GRC/CRC contour violation	B	x		
3022					
3023					
3024	Display description not available	S			

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Continuation: NC alarms, acknowledgeable (ERASE alarms)

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC-Ready2
3025	Display description error	S			
3026	Graphics/text too volum. DIS GGS	S			
3027	Graphics command too volum.	S			
3028	Too many fields/variables DIS DID	S			
3029	Graphics option not available	S			
3030	Cursor memory not available	S			
3031					
3032	Too many fields /variables DIS GGS	S			
3033	Display text not available	S			
3034	Text not available	S			
3035					
3039					
3040	Field/variable not displayable	S			
3041	Too many fields/variables DID DIS	S			
3042	Display description error (serious)	S			
3043	Display description error (not serious)	S			
3044					
3045					
3046	D/D transfer format error	S			
3048	Wrong workpiece definition	S			
3049	Wrong simulation area	S			
3050	Incorrect input	S			
3063	Data block not available				

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Continuation: NC alarms, acknowledgeable (ERASE alarms)

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc.	NC Start	NC Ready 2
3072	Alarm text not available	S			
3073					
3081	CRC not selected on approach	B	x		
3082	Programmed feed missing or incorrect	B	x		
3083	Feed limitation fictitious axis	B			
3087	Transformation data error	B 1)			
3200	e.g. 1N5 working area limit unpermissible	B 1)			
3201	Spindle not synchron	B 1)			
3202	M19 not active	B 1)			

1) The number of the incorrect machine data is displayed as a block number.

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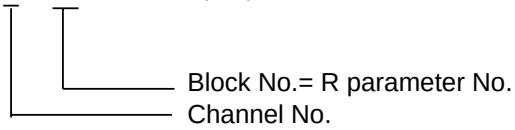
7.1.6 Cycles alarm texts

Alarm No.	Meaning	Block/ sequence related	Interlocking of		
			Proc..	NC Start	NC Ready 2
4000 to 4049	Alarm text for Measuring cycles (OPTION)				
4050 to 4099	Alarm texts for frame-type cycles (OPTION)				
4100	no D-number active	x	x	x	
4101	TO-Radius = 0	x	x	x	
4102	Cutter radius too high	x	x	x	
4103	Tool too width	x	x	x	
4120	No direction of rotation for Spindle programmed	x	x	x	
4121	Spindle not in tolerance band	x	x	x	
4140	Finished part diameter too small	x	x	x	
4180	Option not available	x	x	x	
4200	Check definition R(Nxxx)	x	x	x	
5000 to 5099	Cycles alarms free for user				

Example:

Check Alarm 4200 1 N 32 Definition R(xxx)



It was recognized that Parameter R 32 was defined incorrectly in the cycle operating in channel 1.

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7.2 PLC operating system and user alarms

Alarm No.	Meaning	Block/ sequence related	Proc.	PLC STOP	NC Ready 2
6000 to 6063	PLC user alarm				
6100	Missing signal converter		x	x	x
6101	Illegal MC 5 code		x	x	x
6102	Illegal MC 5 parameter		x	x	x
6103	Transfer into missing DB		x	x	x
6104	Substitution error		x	x	x
6105	Missing MC 5 block		x	x	x
6106	Missing data block		x	x	x
6107	Illegal segment LIR/TIR		x	x	x
6108	Illegal segment TNB/TNW		x	x	x
6109	Overflow B stack		x	x	x
6110	Overflow U stack		x	x	x
6111	MC 5 instruction STS		x	x	x
6112	MC 5 instruction STP		x	x	x
6113	Illegal MC 5 timer/counter		x	x	x
6114	Function macro		x	x	x
6115	System commands inhibited		x	x	x
6116	MD 0000: Alarm byte number		x	x	x
6117	MD 0001: CPU load		x	x	x
6118	MD 0003: Alarm runtime		x	x	x

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Continuation: PLC operating system and user alarms

Alarm No.	Meaning	Block/ sequence related	Proc.	PLC STOP	NC Ready 2
6119	MD 0005: Cycle time		x	x	x
6120					
6121	MD 0006: Last MC 5 time		x	x	x
6122	Illegal jumpering				
6123	Illegal servo scan time		x	x	x
6124	Gap in MC 5 memory		x	x	x
6125	Double assignment input		x	x	x
6126	Double assignment output		x	x	x
6127	Alarm byte missing		x	x	x
6128	Incorrect I/O device jumper		x	x	x
6129					
6130	Synchronization error basic program		x	x	x
6131	Synchronization error MC 5 program		x	x	x
6132	Synchronization error MC 5 data		x	x	x
6133	Illegal block basic program		x	x	x
6134	Illegal block MC 5 program		x	x	x
6135	Illegal block MC 5 data		x	x	x
6136	Sum error MC 5 block		x	x	x
6137	Sum error basic program		x	x	x
6138	EU does not respond		x	x 1)	x
6139	EU transmission error		x	x 1)	x
6140	Restart illegal		x	x	x
6141					
6142					
6143	Decoding DB does not exist		x	x	x
6144	Length of decoding DB not Modulo 6		x	x	x

1) Depends on PLC MD

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Continuation: PLC operating system and user alarms

Alarm No.	Meaning	Block/ sequence related	Proc.	PLC STOP	NC Ready 2
6145	Incorrect quantity of decoding units		x	x	x
6146	Decoding DB too short		x	x	x
6147	Change in distributed I/O devices		x	x 1)	x
6148	Overheating in the EU				
6149	Stop using softkey PG		x	x	x
6150	ACK TO: user memory		x	x	x
6151	ACK TO: link memory		x	x	x
6152	ACK TO: LIR/TIR		x	x	x
6153	ACK TO: TNB/TNW		x	x	x
6154	ACK TO: L PB/L PW/T PB/T PW		x	x	x
6155	ACK TO: Substitution command		x	x	x
6156	ACK TO not interpretable		x	x	x
6157	ACK TO: JU FB/JC FB		x	x	x
6158	ACK TO: on transfer in/out		x	x	x
6159	Run time exceeded Step 5 program		x	x 1)	x
6160	Run time exceeded OB 2		x	x 1)	x
6161	Cycle time exceeded		x	x	x
6162	Processing delay OB 2		x	x 1)	x
6163	Failure of master PLC		x	x	x
7000 to 7063	PLC status messages				

1) Depends on PLC MD

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8 PG 675/685 Alarms

Explanation of abbreviations : **1)** GM General message
OM Operator message
HM Hardware message

No.	Meaning	Type[1)]	Remedy
1	PLC in Stop state: memory compressing interrupted	OM	Bring PLC into ”RUN” status and repeat function
2	PLC memory not plugged in	GM	Provide PLC with memory
3	PLC time-out; No reaction from interface module (IM)	HM	Cable connected? Setting data correct? Interface started?
4	Interface module in PG not ready	HM	
5	Negative acknowledgement received from interface module; abort	GM	Repeat function
6	PLC interface not ready; undefined character received from interface module	GM	Repeat function
7	Incorrect PLC mode or incorrect preset in PG	GM	Change preset. Set correct operating mode (RUN/STOP) on PLC
8	PLC operation aborted with ”Break”	GM	
9	Memory error in PLC	HM	
10	Error in interface module; overflow during data exchange with PG	HM	
11	Interface module status cannot be interpreted as sequential processing of the current statement sequence has been interrrupted in the PLC, e.g. by calling OB 25, OB 26 or OB 27	GM	Addressing error, cycle time error or substitution error
12	Transmitter to PLC not ready; break in transmission cable to IM	HM	PG switches to off-line operation. Cable connected? Interface started?
15	DMA interface IM-PLC not ready	HM	
17	Last network not terminated with ”BE”	GM	Output network and terminate with ”BE”
18	Memory error in PG block buffer	HM	
19	No CPU in PLC	GM	
20	Stack output aborted as PLC is in cycle mode	OM	Bring PLC to ”STOP” status and repeat function

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No.	Meaning	Type[1)]	Remedy
21	Functional identifier in IM unknown	GM	
22	Error in IM program memory	HM	
23	PLC in ”STOP” status, e.g. due to addressing error in progam check	GM	Eliminate addressing error in STEP 5 program
24	Write-protected area in PLC memory	GM	Loading data in this area is not allowed
25	IM operation inhibited as PLC RAM not inserted	HM	
26	Incorrect transmission speed identifier	GM	Adjust admission speed identifier in connector to 9600 bits/s
27	”Break” in receiving line from IM; interrupted control loop	HM	
28	Blocked key	GM	
29	Parity error in PG; error in data exchange with IM	HM	
30	Overflow error in PG; data overflow in PG when exchanging data with IM	HM	Possible causes: Error 9, 10 or PG memory error
31	Framing error in PG; data exchange error with IM	HM	Correct transmission speed?
32	Formatting error	HM	
33	IM operation inhibited on account of existing operation	GM	Simultaneous signal status display on different PGs should be avoided
34	Block gap in PLC	GM	Reset PLC; restart PLC
35	Buffer overflow when loading data into PLC	GM	
36	Incorrect synchronization pattern	HM	Erase EPROM and reprogram it
37	Submodule component error: A: EPROM contains 110/130 PLC program B: EPROM is incorrectly configured	HM	Erase submodule, reconfigure submodule
38	No ”BE” in program	GM	
39	Read check error, level test	HM	Erase EPROM and reprogram it
40	Full EPROM submodule	GM	
41	Empty EPROM submodule	GM	

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No.	Meaning	Type[1)]	Remedy
42	Incorrect EPROM submodule	OM	Check PLC type preset or clear EPROM submodule
43	System diskette inserted in drive 1? Data diskette inserted?	OM	Insert system diskette in drive 1 or drive 0 Insert data diskette as source or target diskette
44	Incorrect diskette system operation	HM	
45	Incorrect diskette directory	HM	
47	Diskette error	HM	
48	Sum check error (cross-check sum)	HM	
49	Erasing not allowed	GM	
50	Space inadequate	OM	Expand if necessary
51	Cursor off screen	GM	
52	Horizontal or vertical expansion not allowed	GM	
53	Parallel branch too remote	GM	
54	Graphic collision	GM	Expand if necessary
55	Riser not alllowed	GM	
56	Bridge circuit	GM	
57	Short circuit	GM	
58	Connection in parallel not allowed	GM	
59	System error		
60	Only output allowed	GM	
61	Output not allowed	GM	
63	Closing not allowed	GM	
64	Storage overflow in PG		
65	Memory area in PLC inadequate	OM	PLC-MD 2 correct? ”2000 PLC user”option?
66	Block already available	GM	
67	Block list is not available in PLC	OM	PLC overall reset
68	Block not available	GM	
69	Block available as test block; cannot be overwritten in PLC	GM	

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No.	Meaning	Type[1)]	Remedy
70	Block available in EPROM	GM	
71	Test block not available	GM	
72	Test block already available	GM	
73	Replacement block (original block) available in EPROM	GM	
74	Block number too big for PLC type (message from IM)	GM	
75	Search criterion not available	GM	
76	User program too large	GM	
77	FB called has no name (**FB No.**)	OM	Output FB and provide name
78	FB called not available	OM	
79	Pre-header not available (in case of DB output format corresponds to preset option; self-generated labels in case of FB)	GM	
80	Connection not allowed	GM	
81	Screen too full	OM	Reduce or break down display
82	Connection pattern not allowed	OM	Check connection
83	Left-hand edge of screen reached	GM	
84	Top edge of screen reached	GM	
86	Negation not allowed	GM	
87	System error		
88	Incorrect block end	OM	Only: ":BE" or ":BEA" allowed
102	Key actuation not allowed	GM	
103	No binary input	GM	
104	Character sequence not allowed	GM	
105	Assignment missing, symbol not defined	GM	
106	Symbol not allowed, no assignment list available	GM	Draw up assignment list or symbols in command not allowed
107	Overflow of assignment list (800) symbols) or empty assignment lists	GM	See Instruction Manual of PG 675
110	Comment not available	OM	Input comment block or alter preset option to comment "*No*"

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No.	Meaning	Type[1)]	Remedy
112	Overview display cannot be output (recursive)	OM	OB 1 missing
113	Overview display cannot be output	OM	
114	Overview display cannot be output	OM	
115	No DB selected	GM	
116	Network not available	GM	
117	Block not terminated	GM	
118	No preceding network	GM	
119	No succeeding network	GM	
120	End of network missing or network has more than 256 statements	GM	
121	Command sequence not terminated	OM	
122	Operator not allowed	GM	
123	Expansion not allowed	OM	If necessary user fewer declarations
127	Jump beyond BLD (end of network)	GM	
128	Declaration error	OM	Use permissible parameter type
129	Not defined	GM	
130	Terminate network	GM	
131	Not defined (e.g. screen form or identifier with impermissible character)	GM	
132	Screen form (e.g. in DBs) not allowed	GM	
133	Not compilable		
134	Operand identifier not defined	GM	
135	Operation not defined	GM	
136	Screen form not defined (e.g. jump to unavailable form)	GM	
137	Incorrect user number (LIB No.)	GM	
138	Operand identifier allowed after this operation	GM	
139	Parameter too large	GM	

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No.	Meaning	Type[1)]	Remedy
140	Character inhibited	GM	
141	Parameter specification not allowed	GM	Byte and/or bit address must not be input here
142	Parameter missing	GM	Input byte and/or bit address
143	Character not allowed	GM	
144	Bit address or dimension not allowed	GM	
145	Bit address or dimension missing	GM	
146	Bit address or dimension incorrect	GM	
147	Declaration overflow	OM	Use no more than 40 declarations
148	Byte address missing	GM	
149	Sign not allowed	GM	
150	Lower parameter limit violated	GM	
151	Upper parameter limit violated	GM	
152	Jump too far (max. +/- 127 words)	GM	
153	Defined twice (form or identifier)	GM	
154	Bracket nesting too deep	GM	
155	Right bracket before left bracket	GM	
156	Identifier not allowed	GM	
157	Close brackets	GM	
158	Incorrect command parameter (cursor indicating faulty command)	OM	Correct command. If command 0 ”PG”, check preset option of PLC type or check PG contents: a) Block? b) 10-/130 PLC program? c) Undefined PG contents (ll)?
159	Command not allowed	OM	e.g. check preset option
160	Printer not ready; printer stops printing	OM	Connect printer Printer defective?
161	Key-operated switch	OM	Disconnect input inhibit (see Section 1.3 of PG 675 Instruction Manual

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No.	Meaning	Type[1)]	Remedy
162	Operand not allowed	GM	
168	Too many brackets	GM	
169	System error		
170	System error		
171	No network available	GM	
174	Screen limit reached	GM	
175	System error		
176	System error		
177	System error		
183	LAD/CSF network not resettable	GM	
188	System error		
189	Network too long (>256 statements)	GM	
190	System error		
191	System error		
192	Block buffer empty	GM	
196	Memory overflow, block too long	GM	
197	Incorrect parameter assignment (formal and actual parameters do not match)	GM	
199	Code not defined (MC 5 ode cannot be identified)	GM	
203	Command not within vocabulary	OM	Verify whether preset options, block type and PLC type are allowed
204	Incorrect PLC type (50-A PLC block, 150-S PLC block)	GAM	
206	System diskette error; abort	GM	
207	No FMT code		See Instruction Manual of PG 675
208	Context error		See Instruction Manual of PG 675
209	Number not allowed		See Instruction Manual of PG 675
210	Parameter not defined	GM	

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No.	Meaning	Type[1)]	Remedy
211	Parameter not allowed	GM	
212	Number too large		See Instruction Manual of PG 675
213	FMT bracket missing		See Instruction Manual of PG 675
214	Bracket already open		See Instruction Manual of PG 675
215	”Right bracket” does not fit		See Instruction Manual of PG 675
217	Memory not connected	HM	Provide PLC with memory
219	Output not connected	GM	
220	Comply with floating-point syntax	GM	
221	KG number not normalized	GM	
222	Format not terminated		See Instruction Manual of PG 675
226	Operation not allowed	GM	
227	Code missing		See Instruction Manual of PG 675
228	Hexadecimal number missing		See Instruction Manual of PG 675
229	ASCII code not allowed		See Instruction Manual of PG 675
230	Cursor off screen	GM	
231	Cursor off screen	GM	
232	Expansion not allowed	GM	
233	DB too large	GM	
234	Line termination not allowed	GM	
235	Repeat factor 256	GM	
236	Byte only allowed up to 255	GM	
237	Fixed point no. -32769 to+32768	GM	
238	Repeat factor 0	GM	
239	Data identifier unknown	GM	
240	Not allowed for target PLC	GM	
241	Too many signs	GM	
242	Time dimension missing	GM	
243	Pre-header incorrect	GM	
244	Only data type allowed is SL	GM	

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No.	Meaning	Type[1)]	Remedy
245	No operand identifier	GM	
246	DB is not an assignment list	GM	
247	Operand identifier	GM	
248	System error		
249	Data word address 0 to 100000	GM	
250	N*W excessive		See Instruction Manual of PG 675
251	Incorrect character		See Instruction Manual of PG 675
252	Control code missing		See Instruction Manual of PG 675
253	Line not recompilable		See Instruction Manual of PG 675
254	DB is not an assignment list	GM	
255	Output of production block not allowed (product number)	GM	

Note:

Error messages from PG 685 S5-DOS Level III, see PG 685 Manual.

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